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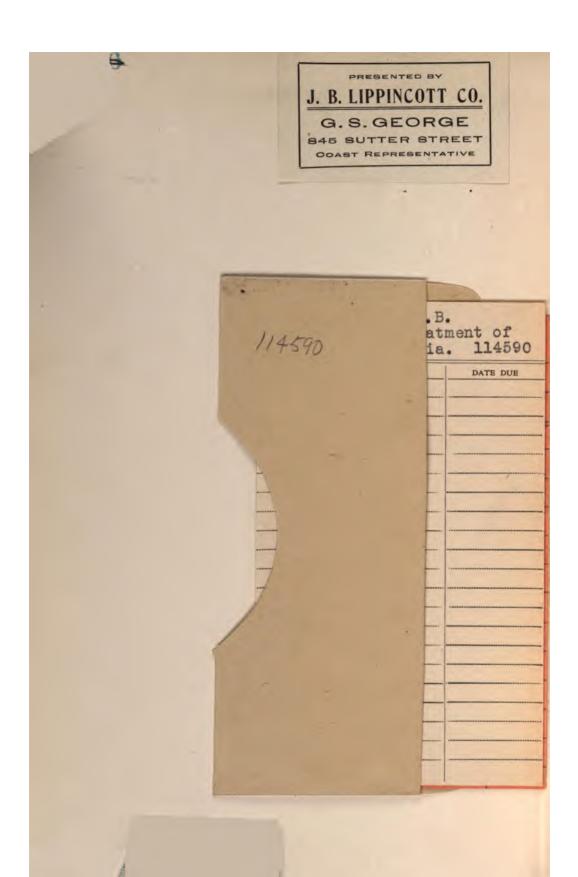
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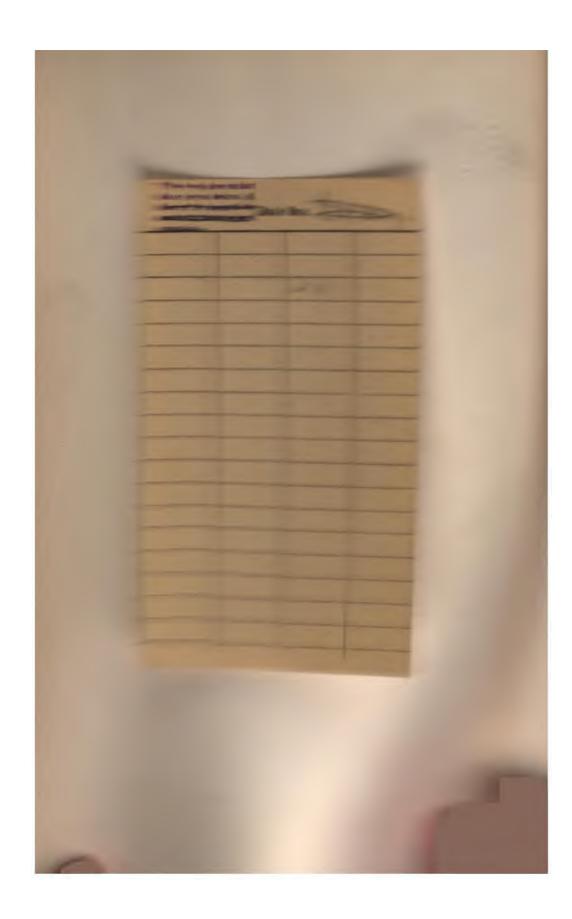
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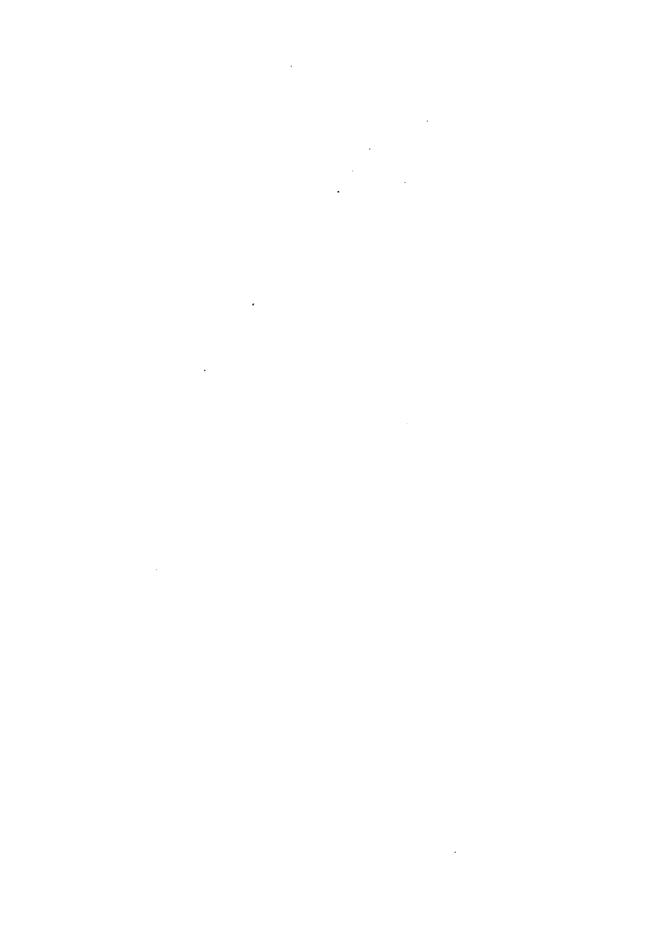
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# MECHANICAL TREATMENT

OF

# ABDOMINAL HERNIA

BY

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### PREFACE.

This little work is intended as a guide in the selection and fitting of trusses, and especially as an aid to those who have no interest in the surgical side of the subject.

No attempt has been made to deal extensively with the anatomy or pathology of hernia, and those who wish to go more deeply into that part of the subject and its surgery are advised to consult the more extensive work by the Author, or the well-known works on anatomy.

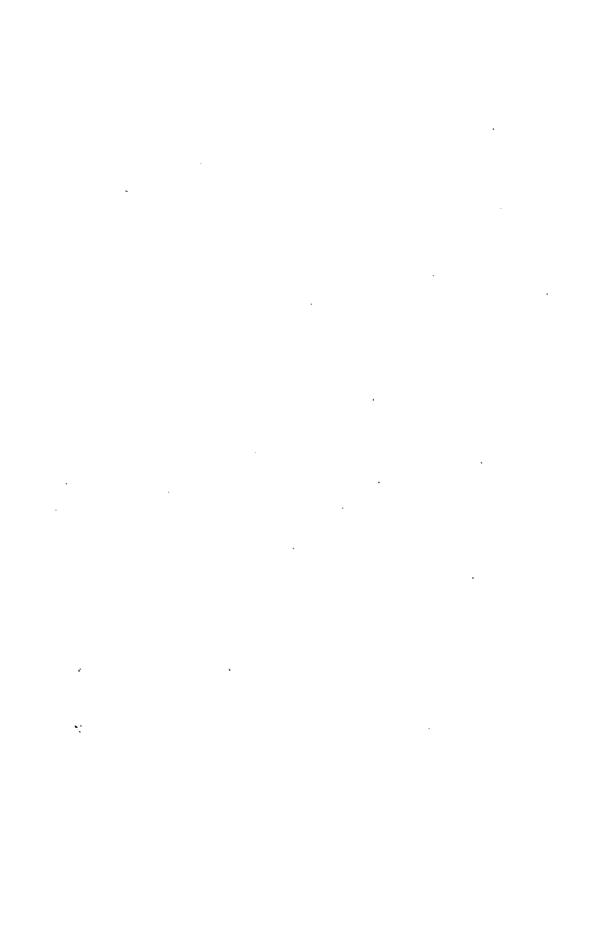
There are hundreds of men who are doing truss fitting who are not medical men, who are doing the best work that they can without either a medical education or a guide of any kind. This work has been prepared in response to repeated requests from them. It is hoped that these truss fitters will find this work useful and suggestive, and that it will lead to more intelligent work.

I am indebted to all of the leading truss manufacturers of this country for willingly furnishing me with such information as they could, and especially to Wm. Horn & Bro., J. Ellwood Lee Co., and Chesterman & Streeter for allowing me to draw freely upon them for cuts for illustration.



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### MECHANICAL TREATMENT

OF

## ABDOMINAL HERNIA

#### CHAPTER I.

#### INTRODUCTION.

**Definition.**—Hernia is the protrusion from a cavity, of any of its natural contents; as hernia of the brain from the cranial cavity, or hernia of the lung from the cavity of the chest. Abdominal hernia is, therefore, the protrusion through the retaining wall of any of the enclosed viscera. This generally occurs at some point in the muscular wall that is weakened by the transmission of nerves and blood vessels, at points congenitally defective, or through muscular parts that have been previously lacerated or incised.

The word "Rupture," so commonly used to denote a condition of hernia, will be, as far as possible, avoided in this work, as it leads to an erroneous impression of what actually occurs. In the early ages this term was applied under the supposition that there was actual rupture of the peritoneum. It is now well known that there is rarely laceration of tissue. Hernia results, in almost every instance, from the gradual stretching of tissue and escape of the abdominal contents, either into a preformed (congenital) sac, or by the formation of a sac (acquired) from the peritoneal lining of the abdomen.

Abdominal herniæ derive their names from the part of the abdominal wall through which they pass. The terms inguinal, femoral, or umbilical, denote at once their place of escape, the exception to this being ventral hernia, which may occur at any point in the anterior abdominal wall other than in the regions named. As ventral hernia occurs at points in the muscular wall so strong as ordinarily to resist hernial protrusion, it follows that when it does occur, it is either due to some congenital defect or is the result of some injury, such as a stab wound or a cutting operation. Extreme distention of the abdomen may also result in such separation of its aponeurotic fibres as to allow of protrusion.

A little more than 73 per cent. of all herniæ are of the inguinal type. Next in frequency is femoral hernia, with 18 per cent., and third, umbilical hernia with about  $8\frac{1}{2}$  per cent. This leaves about 1 per cent. for all of the rarer forms.

The individual may have a single hernia or multiple herniæ. It is not uncommon to find inguinal and umbilical, or inguinal and femoral herniæ in the same subject.

The type, or form, of hernia is notably influenced by sex, as shown by the following comparison:

Male: Inguinal, 96.33 per cent.; femoral, 2.53 per cent.; umbilical, 1.14 per cent.

Female: Inguinal, 50 per cent.; femoral, 33.15 per cent.; umbilical, 15.9 per cent.

That age has a decided influence on the occurrence of hernia is shown by the exhaustive studies of Paul Berger. His tables show 19.6 cases to 1,000 individuals in the first year of life, and drops to 4.2 per 1,000 in the second year; then there is a gradual decline up to the twentieth year when only 0.88 is found. From this time on to the seventy-fifth year the increase of proportion is constant, reaching at this age its highest point, 24.20 per 1,000 individuals.

Hernia consists of the sac and its contents; the sac being formed from peritoneum, the lining membrane of the abdominal cavity. It may be formed at the time of the first protrusion and is then termed an acquired sac. As will be demonstrated later, a congenital sac may have existed long before the protrusion of the hernia, by the persistence of a pouch of

peritoneum (Tunica Vaginalis) which normally should have been obliterated at, or shortly after, birth.

The sac consists of its *body*, or the expanded portion, which contains the bulk of the protrusion; the *neck*, which is the constricted part running through the muscular wall; and its *mouth*, the aperture of communication with the peritoneal cavity.

The acquired sac on first protruding, may be free from adhesions, and reducible, but readily becomes attached to surrounding tissues and from that time is irreducible. It then furnishes a permanent, moist, serous lining to the canal through which it protrudes.

Hernia of the bladder, of the cæcum and sigmoid flexure, may occur without a true hernial sac. The anterior bladder wall is not covered by peritoneum, and it may form the actual protrusion in inguinal hernia. If the protrusion is of fairly large size, it will also drag that part of the organ into the canal that is covered by peritoneum, when both bladder and abdominal contents will be found. This same condition exists in sigmoid and cæcal hernia, except that in these the peritoneum covers the anterior wall of the gut and the posterior wall is dragged down without this covering.

Following previous operations where the peritoneum has for some reason failed to unite, there may be protrusion immediately beneath the skin without sac formation. This is most frequently met with in ventral hernia following laparotomy, but I have found in one instance this condition existing in a recurrent inguinal hernia. It was quite evident that the previous operator had either failed to ligate the neck of the sac properly, or what is more likely, the ligature had slipped off, and both omentum and intestine were in contact with scrotal tissue.

The contents of a sac may be either omentum, intestine, or in fact any of the movable contents of the abdomen. In some rare cases even those organs that are not ordinarily considered movable, as the kidney or a part of the liver, have been

found in the hernial sac. The contents of a sac may be freely reducible, or its reduction may be prevented by the great size of the mass and the smallness of the neck of the sac, or from adhesions of the protruding mass to the inner sides of the sac; also by the formation of fibrous bands which transverse the sac in different directions.

Omentum and small intestine are most frequently found in the hernial sac; next in frequency, in about the order named, will be found the sigmoid flexure, cæcum and transverse colon. The bladder may also protrude into an inguinal hernia sac, but is more frequently found without peritoneal covering.

The term *enterocele* refers to hernia, the contents of which is exclusively intestine, *epiplocele* to one containing omentum, and the use of the words combined, as *entero-epiplocele*, to one containing both intestine and omentum. While these are in some instances convenient terms, they will be avoided in this work on the ground that multiplicity of names adds to the confusion of the subject.

#### CHAPTER II.

#### ANATOMY.

The surgeon must have an exact knowledge of the minute anatomy of the parts involved in hernia before he is competent to perform operations for its relief. This degree of knowledge, however, is not essential to those who are carrying out its treatment by mechanical means. To do good work they must possess a clear comprehension of the surface anatomy and structure of the tissues with which they have to deal. Lack of this knowledge has led many, otherwise good truss fitters, to inflict injury upon the truss wearer, thereby destroying their own reputation.

The contents of the abdomen are retained in position by the abdominal muscles; the external oblique, the internal oblique and transversalis, the fibres of which run in different directions. Besides these muscles there are layers of fat and fascia which have little or no retaining powers. The whole cavity of the abdomen is lined by a thin elastic membrane, the peritoneum. Every form of abdominal hernia must push this lining before it as it protrudes from the abdominal cavity, and this forms what is known as the hernial sac.

There are five weak points in the abdominal wall where hernias are liable to protrude. Two of these are on each side in the groin and the fifth is at the navel.

Those in the groin are known as the inguinal and femoral openings and they are there for the transmission of nerves and blood-vessels from the abdominal cavity to the outer parts.

The inguinal opening, or canal as it is usually called, runs obliquely through the muscular layers and is about one and a half inches long. Through this canal in the male passes the spermatic cord for the blood and nerve supply of the testicle. In the female, it is occupied by the round ligament of the uterus. The femoral opening is for the large vessels of that

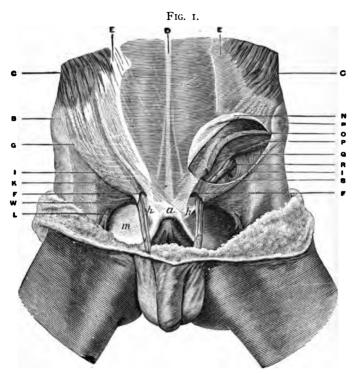
name which pass through here to the leg. When hernia occurs in this region, it is by the stretching of one of these openings, and the pushing through it of bowel, or fat, covered by the lining of the abdomen (peritoneum). When the protruding bowel or omentum (fat) is pushed back, however, the peritoneum remains out and thus a permanent pocket, or sac, is formed.

In truss wearing the neck, or narrow portion of the sac that enters the abdomen, is closed by pressure of the truss pad, but this in the adult does not result in the destruction of the sac or the cure of the condition. In infancy, under the mechanical treatment of inguinal hernia, this sac frequently withdraws from the canal and the muscles so close about the cord that a permanent cure results. This, however, very rarely happens in adult life.

Before birth the mother supports the child by blood-vessels passing into the child's abdomen through the umbilical cord. As the child grows the muscles close around this cord, and after it is cut at birth it diminishes in size so that the opening is closed. In many instances, however, it remains a weak spot and under some strain this opening is stretched and an umbilical hernia is formed. In truss and belt fitting there is very little about the anatomy of the umbilical region that it is important to know, but in work about the inguinal and femoral region it is essential that the fitter should have a clear comprehension of the very important parts involved. This superficial knowledge of the anatomy of the parts can be very well obtained by a study of the accompanying cuts. Those who desire a more thorough knowledge should consult the more extensive work upon the subject.\*

Fig. 1 shows the abdominal wall opened and its different layers clearly portrayed. The cord is shown entering from below the external ring (F); it then shows it lying in the canal, an inch and a half long, its upper end disappearing in what is known as the internal ring (R).

<sup>\*</sup> Abdominal Hernia: Its Diagnosis and Treatment, W. B. DeGarmo, M.D. J. B. Lippincott Co.



A, Symphysis pubis. B. Anterior superior spinous process of crest of ilium. C, Muscular part of external oblique muscle. D, Linea alba. F, F, External abdominal rings. I, I, Poupart's ligament. N, Aponeurosis of external oblique muscle cut open to show deeper parts. O, Internal oblique muscle. This is turned up at lower edge to show (P) Transversalis muscle. (In operative work these muscles are seen as one.) Q, Transversalis fascia. R, Internal abdominal ring. S, Epigastric artery. t, t, t, Spermatic cord. Oblique inguinal hernia leaves the abdomen at R, (Internal ring), and follows the cord to F (External ring). Direct hernia protrudes directly through the wall at F. Femoral hernia protrudes at W. (From Sir Astley Cooper on Hernia.)

In the formation of what is known as oblique inguinal hernia the peritoneum is pushed into the canal at the internal ring (R) and follows the cord until it protrudes at the external ring (F). It is at the latter point that the patient usually first discovers that he has a swelling. If he has what is known as direct inguinal hernia, the protrusion is directly through the muscular wall of the abdomen at the external ring (R), instead of following the canal as in the oblique variety. Direct hernia seldom drops into the scrotum, but oblique inguinal hernia, if neglected, in the process of development after passing through the canal in time follows on down the cord into the scrotum and becomes what is known as scrotal-hernia. This term only indicates a stage of development of oblique inguinal hernia and not a special type. Therefore, the term, "Scrotal hernia truss," is misleading, and incorrect.

Any one who comprehends the anatomy and formation of inguinal hernia will see at once why a truss pad should be so placed that its pressure will come just above the external ring, instead of placing it down over the pubic bone as is so often done.

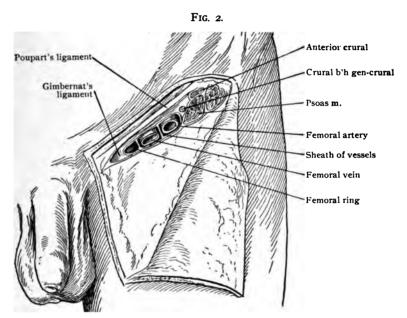
Femoral hernia passes between the lower edge of the abdominal muscles and the muscles of the thigh (see W., Fig. 1), three-quarters of an inch below and the same distance to the outer side of the external ring (R). This is really a direct protrusion, and in reducing the swelling the pressure should be directly back towards the deep parts of the thigh.

The femoral ring is about three-quarters of an inch towards the outer part of thigh and the same distance below the external inguinal ring.

This is more clearly shown in Fig. 2, which also shows the femoral vessels and their close association with femoral hernia.

In fitting a truss for femoral hernia these vessels must be compressed as little as possible, and a small deep pad carried upon a very accurately fitted spring is essential to the safety and comfort of the wearer.

Femoral hernia is also the most dangerous of all hernias, owing to its greater liability to strangulation and the rapidity

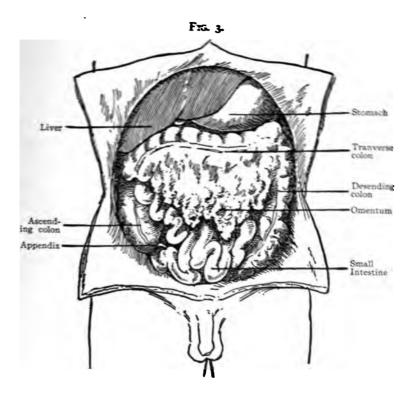


Transverse section showing relation of vessels and nerves to femoral canal.

with which the strangulated parts are destroyed. This is due to the dense and unyielding character of the ligaments which surround the femoral ring.

That truss fitters who have no knowledge of anatomy, may have an understanding of the parts that may protrude in hernia, cut No. 3, showing the contents of the abdominal cavity, is shown. As a matter of fact every organ in the cavity of the abdomen has at one time or another been found in an hernial sac, but the most frequent to protrude are, in the order named, small intestine, omentum, large intestine, and rather rarely the stomach.

The omentum most frequently forms adhesions to the sac and becomes irreducible, placing the hernia entirely beyond the control of a truss.



#### CHAPTER III.

### SYMPTOMS AND DIAGNOSIS OF INGUINAL HERNIA.

#### REDUCIBILITY OF NON-STRANGULATED INGUINAL HERNIA.

Hernia is seldom irreducible from its inception, but almost always becomes so as the result of neglect, producing one of the following conditions: (a) Gradual protrusion through a small canal until the bulk of the mass prevents its reduction. Adhesions of protruding contents to sac walls, or bands within

- (c) Hypertrophy of protruding omentum.
- (a) Herniæ named under the first heading are not necessarily irreducible, as by confinement to bed and repeated manipulation they frequently can be returned to the abdomen. This was illustrated in a series of cases, reported before the New York Academy of Medicine, by the author a number of years since. The subsequent histories of these very cases, however, proved conclusively that it was not an advisable procedure. as several of them furnished emergency operations by the recurrence of the protrusion (in some instances, several months afterwards) with symptoms of strangulation, notwithstanding the fact that careful truss-fitting had been carried out. best, therefore, to consider and treat these as cases of irreducible hernia.
- (b) Adhesions of omentum to the sac wall are very common in inguinal hernia, but it is rather rare to find the bowel This is doubtless due to the sluggish character of the former, and the peristaltic action of the latter. In very old and large herniæ, the normal motion of the bowel may be lost, and then adhesions form. Such cases are subject to the most obstinate constipation, terminating in true intestinal obstruction, and this is quite liable to cause death from paralysis of the bowel, even if operation is done. In these herniæ, bands of

connective tissue may also be found running in various directions through the sac, effectually preventing the return of its contents.

(c) A very common cause of the irreducibility of hernia is the hypertrophy and growth of protruding omentum. It





Left scrotal oblique inguinal hernia containing large mass of irreducible omentum.

becomes hard, nodular, and of such size that it is impossible to pass it back through the canal even though no adhesions are present. It rarely happens that these masses of protruding omentum plug up the canal so that the intestine cannot protrude. On the contrary, such cases are always attended by increased dangers of strangulation.

Fig. 4 shows an irreducible hernia where a large mass of hypertrophied omentum was found at time of operation. Fig. 5 shows an even larger hernia when the contents were mostly intestine and wholly reducible.

Methods of Examination.—Inspection should be with the patient standing, and if a truss or support is being worn, it



Fig. 5.

Enormous left scrotal hernia in man of 60 years. Note testicle at bottom of tumor, showing that hernia is not of the congenital type.

should be removed. By this we will gain an accurate idea of the size and shape of the tumor, which will be a great aid in diagnosis. If nothing is seen but a small bulging in the vicinity of the internal ring with no history of larger swelling, make *sudden* pressure over the upper part of the canal with the ends of the fingers and if something is felt to slip back into the abdomen, we may safely conclude that we have to deal with

an incomplete inguinal hernia. If the swelling extends outside the external abdominal ring, and it is oblong in shape and reducible, it is probable that the case is one of complete oblique inguinal hernia; its reducibility, however, may not be ascertainable until the patient has been placed in the recumbent position. On inspection it may be seen that the swelling is circular in form and stands out from the body without much, if any, tendency to follow the cord, and this would indicate a direct inguinal hernia. If, on the contrary, it has already dropped into the scrotum, we may be certain it is an oblique inguinal hernia, and is either congenital or acquired. If congenital, and the hernia is protruding, the location of the testicle is obscured. the swelling is reducible, there will be found an amount of thickening of the tissues, about the cord, that does not exist normally. If the photographs are carefully examined it will be readily seen that all congenital herniæ present a swelling, uniform in shape, and usually with a comparatively small neck, while in those with the acquired sac, no matter how large they may be, the location of the testicle is plainly visible. This absence of testicle is also noticeable in sigmoid and cæcal hernia, but it will be seen that these herniæ are frequently quite different from any of the other forms.

Palpation.—The feeling of a swelling carries with it many valuable suggestions as to whether it is hard, nodular, and perhaps irreducible, indicating adherent and hypertrophied omentum, or smooth in outline, fluctuating and elastic, as in a fluid cyst. The pressure of the fingers on the tumor may produce the "gurgling" of gas in the intestine, so characteristic of bowel protrusion.

Under this heading may be noticed, also, the character of impulse on having the patient cough, to note whether it gives the impression of merely pushing the tumor forward without expansion. It must not be forgotten that in an abdominal varix, or large varicocele, there is upon coughing a *thrill* in the enlarged vessel that might easily be mistaken for *impulse*. This holds equally true of a partially filled fluid cyst. It is also true

that many people who have no hernia and perhaps little tendency to it, have a decided impulse on coughing; it is, however, projectile and not expansible impulse. In view of all these facts as an indication of hernia, impulse is not considered of great importance even though it is given a prominent place by almost every writer on hernia. In my own work, both public and private, I have placed little reliance on it.

I desire to suggest here an excellent diagnostic test which I have used and taught for many years. While the patient is standing and with the tumor at its largest size, the fingers of one hand are held firmly over the inguinal canal, maintaining firm pressure while he lies down. Gentle pressure may now be made on the tumor by the unoccupied hand. It is usually not difficult to distinguish the character of the contents of the tumor as they pass under the fingers which still compress the canal. The rush of fluid, the nodular, irregular feeling of omentum, or the "gurgling" of gas in the bowel, all tell their own story.

The tumor having been entirely reduced, reverse this test by supporting the canal while the patient gets on his feet. After standing for a time, fluid will gradually pass the supporting fingers, but omentum or bowel will be retained. This is a diagnostic test, and indicates just what will occur in the mechanical treatment of these cases, *i.e.*, that fluid cannot be retained by external support.

Percussion aids materially in deciding between the solid character of omentum with its flat note, and the resonant note given off by gas imprisoned in protruding bowel.

Invagination of scrotal tissue, upon the finger (Fig. 6), is a method that needs more condemnation than praise, and I have repeatedly cautioned my classes against its indiscriminate use. It is useful and allowable in large herniæ in order to decide whether they are perfectly reducible, but its use on a person suffering from a small complete or an incomplete hernia in this way is an injustice and of little benefit to the examiner. By forcing the finger up into the external abdominal ring, that

aperture is certainly enlarged, and but little real information is obtained. It is no uncommon thing to find people with very large external abdominal rings who have no hernia, and some of those who have it of moderate size have comparatively small rings. In my clinic at the New York Post-Graduate Medical School I have had, within the past ten years, three men tell me





The method of examining hernia here shown—passing the finger into the canal by invaginating the scrotal tissues—cannot be too strongly condemned.

that they had hernia produced in just this way, in order to avoid military service in Germany. Two of these men had employed a woman who seemed to be an adept at it. The usual time required to produce a noticeable hernia was three days, and it was accomplished by dilating the inguinal canal with the finger invaginated in the scrotal tissues, following the cord as a guide.

Indigestion, constipation, and prostration are results, and therefore symptoms, of hernia more frequently than generally supposed. It has been no uncommon experience to see cases that persistently resisted drug treatment, entirely cured of obscure intestinal troubles by the perfect retention of hernia. While constipation is undoubtedly more frequently a cause, it is, in large and uncontrollable herniæ, a most common and dangerous result. It indicates a paralysis of the protruding bowel which, if not heeded, will result in intestinal obstruction that has hitherto proven beyond medical or surgical skill to There is also an amount of prostration present in many of these cases that is wholly disproportionate to the degree of departure from a normal condition. The effect of an unretained hernia upon men has been compared with that produced upon women by some uterine derangement that may in itself be trifling. The mental effect is sometimes very serious and should be promptly counteracted by the physician. cases of suicide, the impulse having its direct origin in existing hernia, are within the personal knowledge of the author.

Pain.—In by far the greater number of cases, the first indication of hernia is in the presence of a swelling. This may be discovered by the patient when it is only a slight bulging, but it is no uncommon thing to have him come with swelling as large as an egg or orange, which unquestionably has been of slow growth and still has not been noticed. Naturally he assumes that it has just occurred and gives a history that is misleading. It proves conclusively, however, that hernia may reach considerable proportions without sufficient pain to call the patient's attention to the parts.

If the development of hernia is rapid and from violence, it may be attended by a certain amount of pain, but under ordinary conditions this is unusual. There is sometimes a smarting or burning sensation in the inguinal region, and this is very liable to be present in omental protrusion. It is believed that those patients who complain of extreme sensitiveness and pain, should be looked upon as suspicious and doubtful cases, so far

as diagnosis of hernia is concerned. If hernia really exists, other troubles are also liable to be found; as an inflamed cyst on the cord, an inflammation of the cord itself, or possibly an acute adenitis of the inguinal glands. Sometimes a burning sensation is complained of as occurring late in the day and disappearing during the night. It is more common, however, for





Enormous irreducible left scrotal hernia, 20 years' duration, no treatment. Age, 45 years. Notice testicle at bottom of scrotum, showing that it is an acquired sac.

the patient to complain of weakness, or dragging pain, in the lower part of the abdomen, worse at night and better in the morning, which is increased while straining at stool, sneezing, or coughing. Almost all writers on the subject agree that it seldom happens that hernia of goodly proportions develops suddenly, except in the congenital type where the sac is already formed. In the latter cases, when the neck of the sac

is sufficiently dilated, a good-sized hernia may drop at once into the pouch that awaits it.

Swelling.—The swelling, which to the patient may be the first indication of hernia, usually disappears when he is in the recumbent position at night, and may not return the next day until he has been on his feet several hours, or it may return



Fig. 8.

Showing large scrotal hernia with true peritoneal sac; outlines of testicle well defined on the same side.

as soon as he gets out of bed. When it is well developed it is quite certain to drop into its sac as soon as he is in an upright position. Such a swelling is probably a reducible hernia. If neglected, the neck of the sac and the tissues surrounding it become more and more dilated, allowing the hernia to increase in size until it attains proportions that are truly enormous, and the patient becomes a burden to himself and friends.

#### CHAPTER IV.

# MECHANICAL TREATMENT OF INGUINAL HERNIA.

It is intended to give in this work a more comprehensive guide than has hitherto been within the reach of truss fitters. In works on Surgery, this important part of the subject has been dealt with in the most superficial manner.

Trusses are remedies for the treatment of hernia, and from the excellent variety made it is usually possible to select one suited to the requirements of a case in hand. He who expects to treat all types of hernia with a single form of truss is as far wrong as the doctor who is looking for one drug, or a combination of drugs, that shall be suited to the cure of all his patients. For this reason patented trusses are unreliable, as a rule; in fact, I know of no patented trusses worthy of extensive use.

A considerable variety of good trusses are made by reputable manufacturers, who are very willing to make any variation that physicians may suggest in their construction. The difference between such trusses is largely in detail of construction, the types being essentially the same, and none will be mentioned in this work that cannot be obtained from any of the large producers. The United States leads the world in production; in fact, it is safe to say that more good trusses are made in this country than in all of the rest of the world put together.

#### CLASSIFICATION OF TRUSSES.

It has been a serious problem to present to my reader a large variety of good appliances, from which he may select intelligently, without transforming my work into a trussmaker's catalogue. It is essential, however, that the reader be shown what is believed to be the better types, as well as some of the bad ones, and told wherein the latter are defective, so that GROUP OF SPRINGLESS OR ELASTIC TRUSS TYPE.



1. Ordinary single elastic truss.



2. Elastic truss with special pad.



3. Double elastic truss with elliptic spring on front plate.



4. Elastic truss with German pad.

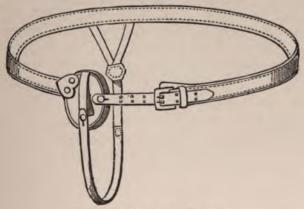
GROUP OF SPRINGLESS OR ELASTIC TRUSS TYPE (Continued).



5. One piece elastic truss.



6. Elastic truss with hard rubber front plate.



7. Moc-Main (English) truss, leather.

he may discriminate against them. I have endeavored to solve this problem by grouping together those of a certain type and speaking of them in a general way, rather than individually. All worthy of favorable or unfavorable mention have been placed in a few groups, and the reader can readily fix in mind the principles involved in each. This grouping is also in a measure historical, for, as a matter of fact, endless varieties have descended from a few types. These groups have been placed in the following historical order:

- (1) Springless type. Earliest history (900 B.C.) to date.
- (2) French-German type. 1306.
- (3) Cross-body type (English). Royal Pat., October 27, 1806.
- (4) Chase type (American). 1837.
- (5) Hood type (American). 1847.
- (6) Unclassified.

Perhaps the remotest historical record of the truss is contained in the statuette, a cut of which is at the beginning of There is little doubt that the earliest form this chapter. consisted of a pelvic belt with a compress over the inguinal canal, held in place by a perineal strap. From this prehistoric truss used by many nations, civilized and uncivilized, has descended the group of springless trusses, a very few of which In this country they have been best known are shown. as the "elastic truss" because of their being made of heavy elastic web. In England this type is known as the Moc-Main, and consists of a strong pelvic belt, made of leather, to which is attached a good-sized pad held down by a perineal strap (No. 7 of group). It is believed to be in many respects better than our elastic truss. It is more durable, and, being nonelastic, is more reliable in the retention of the hernia. also upon the pad a small spring, to which the perineal strap buttons, that turns its lower end under, giving an upward as well as a backward pressure.

I regret to state that, in this country, more elastic trusses are sold than any other form. That this is not because of their

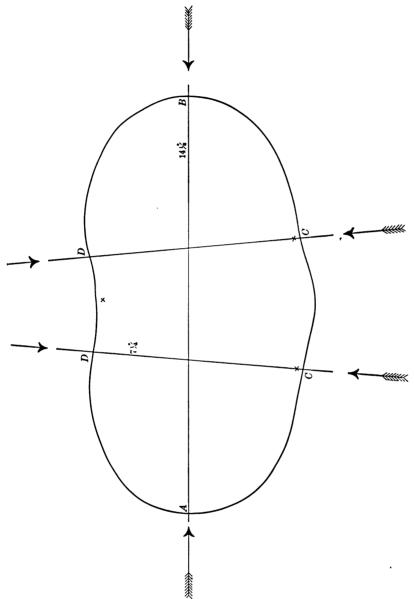


Diagram of 38-inch pelvis. Bilateral diameter, A to B, 14% inches. Antero-posterior diameter, C to D 7% inches. C, Inguinal region on either side.

greater value is demonstrated by the fact that some manufacturers who supply such a large demand seldom use them, in their own fitting-rooms, when the truss-selection is left to their best judgment. Their extensive sale is due largely to the fact Those suffering from hernia can that they require no fitting. buckle them on without difficulty. Furthermore, they wear out much sooner than other forms, the wearer frequently being obliged to renew his truss two or three times a year instead of wearing it several years. Springless trusses are, however, very defective in action, and their use in many instances results in serious trouble. Few people wear them for any length of time without finding their herniæ worse than when they began. This occurs because the pad is drawn down against the pubic bone by the perineal strap, leaving the upper part of the canal unprotected and consequently occupied most of the time by a part of the hernia. A hernia held at the external ring only, is poorly held and sure to increase. If the pelvis were as round as a barrel, the springless truss would be more effective, but as its transverse exceeds by fully one-third its antero-posterior diameter, it is thoroughly unscientific (Fig. 9).

A flexible band surrounding the hips and drawn tightly, will produce far more pressure over each hip than over the inguinal region where it is needed. A band of this character will not maintain its position upon the body without the perineal strap, and this is, for reasons which will suggest themselves, an abomination, as well as positively injurious. importance of retaining hernia within the internal ring cannot be too strongly emphasized. In many instances injury results from placing the supporting pad over the pubic bone and external ring, allowing thereby the upper part of the canal to be constantly occupied by a loop of bowel or piece of omentum, and compressing the cord against the bone, producing atrophy of the testicle in some instances. this is their lack of cleanliness, which alone is quite enough to condemn them for general use. They have one valuable use and that is, as a night truss. Ordinarily this is not needed by the adult, but if from the enormous size of the hernia or a persistent cough the protrusion takes place at this time, these springless trusses serve a good purpose. There is little doubt that most wearers would get a greater degree of improvement by the use of a night truss, but the one that is exactly suited for the day is entirely unsuited for the night, and the reverse holds equally true.

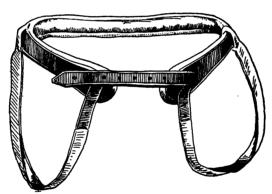
French, German, and English Trusses.—In the second group is shown a type of truss that has been well known in this country, and in most foreign countries, for many There are an endless number of variations in the minor details of its construction, but the general type remains. Doubtless it represents the first form of metal spring, and it had its origin either in Italy or France, probably the latter. The first recorded use of metal for a truss spring was, according to Macready (A Treatise on Ruptures, Jonathan F. C. H. Macready, F. R. C. S., p. 195), the iron-band truss recommended by Gordon in 1306. Steel was first used by Nicolas le Quin of Paris ("The Sign of the Golden Truss") in 1628. It is possible to present only a few of the numerous descendants of this type. In this country they have been known to manufacturers as the French (nos. 6, 7, and 8 of group) or German (Nos. 3, 4, and 5 of group) truss, the only distinguishing feature between them being that the former are made lighter. and usually bear some decorations in the form of fancy stitching or embossed flowers upon the leather forming the outer surface of the pad.

This form of truss as made in England (nos. I and 2 of group) is superior in two important particulars to those made here, and whether their origin was the same is not known. In the French-German truss the spring passes around the back to a point three or four inches beyond the spine, terminating over the gluteal muscles. In the English form this spring continues far enough around to clasp the opposite hip, thereby holding itself securely in place. It also has the retaining pad placed in a line almost parallel with the spring instead of arching

GROUP OF TRUSSES, FRENCH, GERMAN, AND ENGLISH TYPES.



1. Single English type.



2. Double English type.



3. Single German type.

GROUP OF TRUSSES, FRENCH, GERMAN, AND ENGLISH TYPES (Continued).



4. German type (so-called "scrotal-hernia truss").



5. Double German truss.



6. French truss.



7. Adjustable French truss.



8. Hard-rubber or celluloid French truss.

abruptly down over the pubic bone as in the French-German truss. These are two serious defects in most of the trusses made in the United States and Germany. Fortunately some of the larger manufacturers are recognizing this defect and endeavoring to correct it. The centre of the truss pad should be very nearly on a line with the centre of the spring, in order to have it effective and comfortable. When the pad is thrown





Typical illustration of bad truss fitting with a French-German truss, frequently seen. Note that the pad acts as a compress directly over the pubic bone, and that the hernia is in the canal above.

down so low that its lower edge rests upon the pubic bone it ceases to be a reliable support, acts as a compress over the bone, and may for a time keep the hernia out of the scrotum, but the canal is gradually being dilated to such an extent that the hernia eventually becomes almost, if not quite, uncontrollable. The accompanying illustrations (Figs. 10, 11, and 12) show this serious defect in truss-making and truss-wearing. The first pictures the case of a young man who, under the use of this

type, had gradually grown worse until it was almost impossible to retain his hernia; it is not uncommon to see these trusses worn in this way. The second photograph shows him with a Hood truss holding his hernia in proper position. As he was weak upon the left side, a thin pad for moderate support was placed over that region.

Perhaps the worst feature of this form of truss, as now made, is in the fact that even if the pad is properly placed over



FIG. TI.

Same case as Fig. 60, with properly adjusted De Garmo-Hood truss retaining hernia within abdomen and with thin pad for support of opposite side.

the inguinal canal, it will in a short time drop down over the pubic bone. The reason for this is that the spring naturally seeks the spot around the hips where it is least influenced by muscular action. This neutral point is midway between the crest of the ilium and the trochanter major (Fig. 13), above the active muscles of the thigh and below those of the abdomen. In this position the front end of the spring terminates over

the middle of the canal. If the retaining pad is two inches below the spring, it will be seen at once that it must rest upon the pubic bone when the spring rests in its normal position. This criticism applies with equal force to all of that vast variety of trusses of the type shown in the group under consideration and by the Chase type, to be spoken of shortly. The English





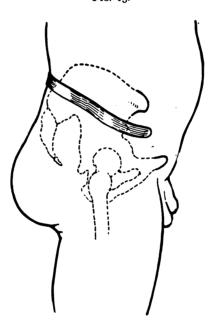
Usual manner of wearing the so-called German style of truss. The herniæ on both sides are protruding into the scrotum. The canals are entirely unprotected.

type of this group is very good, and the farther away from this form the more imperfect is the truss of this pattern. While trusses of this group have an enormous sale few expert truss-fitters use them; the German instrument and truss makers, however, use them almost to the exclusion of all others.

Cross-Body Type.—Towards the close of the eighteenth century, Salmon & Ody, an English firm still in existence, made

an important change in the form of truss springs, establishing one of the most valuable types of truss that we now have for the treatment of single inguinal and femoral hernia, known as the cross-body truss (No. 1 of group). The spring, instead of surrounding the hip on the side of the hernia, passes from the canal directly across the lower abdomen and around

FIG. 13.



Position in which spring should rest about hip. Midway between crest of ilium and trochanter major, its end in front over internal ring. If it comes across abdomen it should terminate at the same point.

the hip of the opposite side. As originally made this truss had a convex pad over the inguinal region, held to the spring by a ball-and-socket attachment. The spring after passing across the abdomen and around the hip opposite the hernia, terminated over the spine, where there was another circular pad held by the same method of attachment.

This truss was later modified, in this country, by putting

### ABDOMINAL HERNIA.

GROUP OF TRUSSES OF THE CROSS-BODY TYPE.



1. Cross-body truss, leather cover, ball-and-socket pad.



2. Hard-rubber cross-body truss.



3. Hard-rubber, cross-body truss, small back pad. Continuous-spring.



4. Hard-rubber "radical-cure truss."

GROUP OF TRUSSES OF THE CROSS-BODY TYPE (Continued).



5. Radical-cure truss. Continuous-spring cross-body



6. Leather covered continuous-spring cross-body truss.



7. Radical-cure truss, large leather covered back pad.



8. Army and Navy truss.

## ABDOMINAL HERNIA.

GROUP OF TRUSSES OF THE CHASE TYPE.



1. Chase truss.



2. Foster ratchet modified Chase truss.



3. Adjustable pad Chase truss.



4. Adjustable ball-and-socket, with set screw.

## GROUP OF TRUSSES OF THE CHASE TYPE (Continued).



5. Modified set screw Chase truss.



6. Modified hard-rubber Chase truss.



7. Curved neck, ratchet pad.



8. Adjustable pad and set screw.

on an elongated back pad (Nos. 1, 2, and 4) that should press on either side of the spine, its centre being arched; and by making the spring longer (Nos. 3, 5, and 6) so that it would terminate over the gluteal region, directly back of the hernia, either in a circular pad or continuous with the strap that completes the circumference. The special advantages of this spring are—that it surrounds fully three-fourths of the body and, when properly fitted will retain its position, even though no strap is used; it furnishes a longer, and therefore a more elastic, spring. The direction of the pressure is from the front pad to the centre of the back, and as it crosses the back at a slight elevation over the front, it has a slight upward pressure. It is convenient to the dealer because it can be quickly converted from a right- to a left-side truss. There are many modifications as to the form of retaining pad and its method of attachment to the spring, but, while convenient, they are not essential.

In this form, with such modifications as can be made to suit individual peculiarities, we have one of the most valuable appliances for the treatment of hernia that has ever been devised.

Chase Type.—This form began with the truss bearing the name of its inventor, Dr. Heber Chase, 1837. It was issued during the war of the Rebellion (1861-5) to soldiers who developed hernia in the service. It consisted of a spring of the French type to which was attached in front a soft, malleable iron neck, curved downwards, holding a polished cedar pad. The pad was held by screws, passing through a slot in the iron neck, so that it could be raised or lowered and the neck easily bent into any desired position. The truss was considered quite an improvement on its prototype which undoubtedly was the French truss. It has many descendants, a few of which are shown in their group.

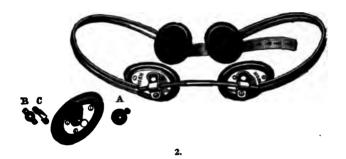
To a lesser degree they are all open to the objections that have been offered to the French type. The pad-centre being considerably below the spring-centre is an objection already mentioned. Also, the springs like all those that go on from the same side as the rupture, are dependent upon the strap for retention of position, and when this stretches, or is improperly adjusted, they are very liable to shift their position and allow the hernia to protrude. For perfect fitting, comfort, and security, they do not compare favorably with the cross-body or Hood type of truss.

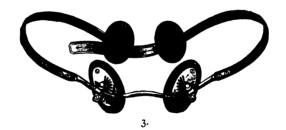
Hood Type.—This is apparently an original type, purely American, the invention of Dr. I. W. Hood of Kentucky. In its existence of nearly seventy years, this truss has passed through many hands and has been the subject of many improvements, but its general type remains. Its spring is solid in front, surrounding both hips, and terminates within about two inches of the spine on either side. Usually it has circular pads attached to the spring ends in the back upon which the counter pressure is taken, but some makers put on instead a flat, oblong disk which broadens the spring at this point and distributes the pressure over a greater surface. retention pads used in front are of various shapes and designs, and may be selected to suit individual requirements. original Hood pad is, however, for general use, an excellent It is thick at its lower edge, thin at the top, and in action presents a moderately convex surface over the inguinal canal. The pubic portion of the Hood spring has, on either side, a slot which runs parallel with, and is directly over, the inguinal canal. Transversely to this slot is another in the pad, and between the two there is quite a wide range of movement for accurate adjustment. When the adjustment is complete the pad is solidly fixed to the spring by set screws, which prevents motion between them while in use.

The action of this truss is peculiar in that it does not depend wholly upon compression or spring action. It has, in fact, been extensively and very successfully used in a metal that has scarcely any spring action. It acts as a resisting frame about the pelvis with the pad making firm pressure over the inguinal canal when the wearer is in an upright position. Should he cough or strain, the abdominal wall is thrown for-

GROUP OF TRUSSES OF HOOD TYPE.



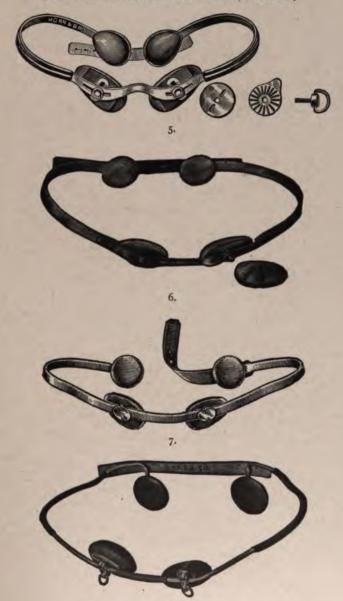




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GROUP OF TRUSSES OF HOOD TYPE (Continued).



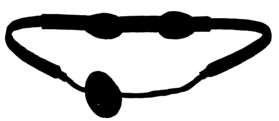
GROUP OF TRUSSES OF HOOD TYPE (Continued).



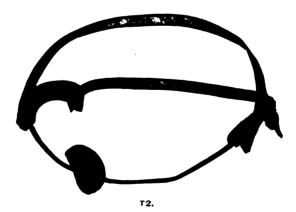
9.



IO.



II.



ward, but firmly met and restrained by the pad fastened to the pelvic frame. If, however, he should lie down, the frame would not follow to any extent the receding surface of the abdominal wall. Many truss makers have not fully comprehended this action of the Hood truss and have made the

FIG. 14.



De Garmo-Hood truss applied. Right complete inguinal hernia. Left incipient hernia retained by thin "dummy" pad.

springs too heavy and with too much action, this error being fostered by the necessity of strong spring action in other forms of truss. The fact that in this truss a larger amount of compression can be dispensed with, makes it a much easier form for the patient to wear. When completely at rest, the wearer is in a measure relieved of pressure, which is a great comfort, quite in contrast with the tireless and never ceasing pressure

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from a spring, the ends of which are endeavoring to come together.

The Hood spring should surround the pelvis very nearly in a straight line, and some manufacturers have ruined it by arching the sides too high. As soon as this is done it loses its pelvic-frame action, the pads drop down over the pubic bone, and the truss then has many of the objectionable features of the trusses which have the pad set on a





De Garmo-Hood truss applied. Back view.

descending arm. The shapes which are best for general use are shown in Nos. 6, 7, and 9 of the Hood type group. The Hood spring also has the advantage of carrying one or two pads, but it is always best with two. The one over the side not ruptured may be very thin and is called in the trade, a "dummy" (Figs. 14 and 15).

A person with one hernia is quite liable to develop another on the other side, which is more likely to happen when a single truss is worn than when none is used, for the reason that

the pressure against one side of the abdomen throws the intra-abdominal pressure towards the other side. Again, where double hernia exists, this solid-front spring is desirable because there can be no change in the relative position of the pads, by the stretching of a strap as in other forms of double truss, or by error of adjustment by the wearer. Increased weight and consequent change of size, is also better provided for by the adjustment of the strap in the back than in front. A person may gain or lose several inches in size without any relative change in the position of the two inguinal canals. When the wearer becomes tired and wishes to relax the constriction of a truss, it can be done if fastened in the back, without disturbing its position in front; on the contrary, if the pads are held in position by a strap in front, the moment this is loosened they are out of adjustment and the wearer is liable to accident.

The truss of this type that I have used for many years, more than any other, is shown in No. 7 of group, or Figs. 14 and 15, applied. It differs from the others principally in its lightness, simplicity of construction, and in the fact that the spring is made of hard-rolled German silver instead of steel. It is covered by hard rubber and the pads are attached by simple clasps that allow of adjustment.

There are few expert truss fitters in this country who have not used extensively the Hood type of truss, while some have used it almost to the exclusion of all other forms. It is easier to fit than almost any other, and certainly easier to wear. The special advantages of the Hood truss are believed to be:

- (1) It passes around the pelvis at the most immovable part.
- (2) Surrounding both hips gives it stability.
- (3) It retains with relatively less pressure.
- (4) It protects one or both canals.
- (5) Counter pressure is on the gluteal region where best tolerated.

It has, however, the disadvantage of being somewhat more expensive to manufacture than other forms, and for this

# ABDOMINAL HERNIA.

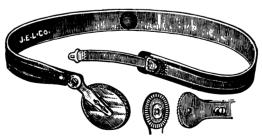
UNCLASSIFIED GROUP.



1. Wire-Spring Truss.



2. Spring and elastic web combined



3. Spring and elastic web combined.

Double Truss Group.



r. Double ball-and-socket truss.



2. Double hard-rubber truss.



3. Modified Chase Truss.

### ABDOMINAL HERNIA.

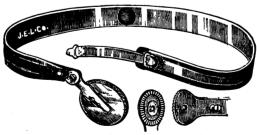
Unclassified Group.



1. Wire-Spring Truss.



2. Spring and elastic web combined



3. Spring and elastic web combined.

Double Truss Group.



1. Double ball-and-socket truss.



2. Double hard-rubber truss.



3. Modified Chase Truss.

#### ABDOMINAL HERNIA.

DOUBLE TRUSS GROUP (Continued).



4. Modified radical-cure truss.



5 Radical-cure truss.



6. Adjustable set-screw truss.

DOUBLE TRUSS GROUP (Continued).



7. Elastic web and spring truss.



8. Adjustable French truss.



9. Double elastic truss.



10. Double German truss.

reason alone, many truss sellers have declined to carry them in stock. The physician should impress upon his patient the truth, that to the ruptured man a good truss, well fitted, is more important to him than his clothes. Undue economy in this connection is poor policy.

Unclassified Group.—There is also a group of trusses that cannot be classified with any of those already mentioned. It contains one (No. 1) upon which I have never looked with much favor though I have known good truss fitters unbiased by personal interest, who claim to have found it satisfactory. Large numbers have been sold to dealers throughout the country, and for that reason it seems best to mention it here. It has the appearance of an original type of truss, and I believe the makers considered it such, but as a matter of fact Dr. Tod of London, England, patented (about 1858) a truss to which this is exactly similar except in details of construction, his being made of a steel spring occupying exactly the same position as this, held in place by a similar band, while this is made of spring brass, or other wire, so shaped that one piece forms not only the spring, but the frames for both the front and back pads. The advantages of this truss are in its extreme lightness and small cost of construction. Its disadvantages, as they present themselves to me, are its great liability to become displaced, lack of durability and general inefficiency. Its retention in place is absolutely dependent upon the web band which surrounds twothirds of the hip. Furthermore, the length of the spring, from the crest of the ilium to the hernial pad in front, is such, that in bending forward the pad is forced down over the pubic bone. Wearers have complained to me in reference to this as a great inconvenience, and it is certain that any truss pad that is so liable to displacement, must be looked upon as very dangerous.

Nos. 2 and 3 of this group represent a combination of a short steel spring with an elastic band. It is a modification of, and I should think something of an improvement upon, the elastic truss.

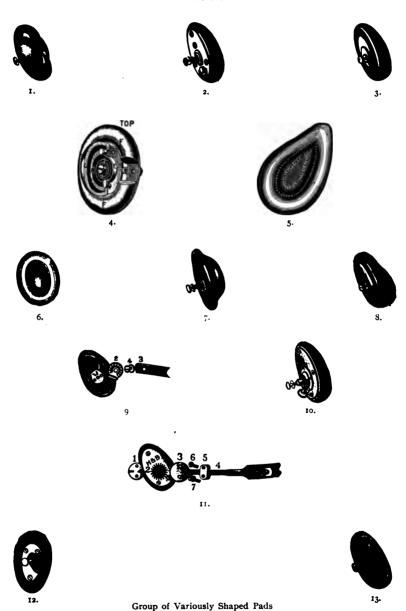
**Double Truss Group.**—This group merely presents the same type of trusses already illustrated, as arranged for double instead of single hernia.

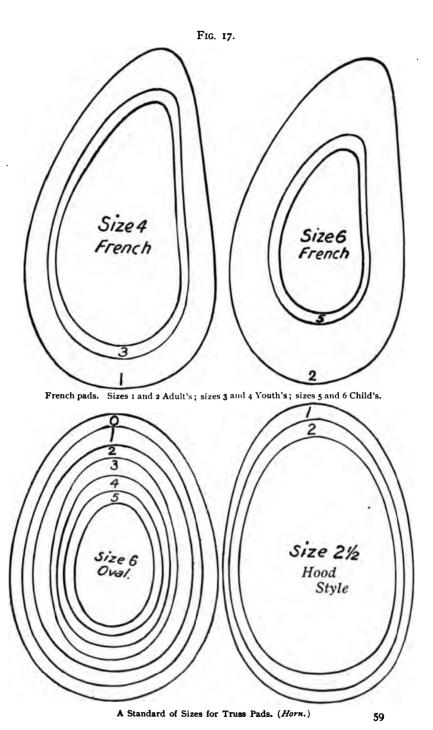
Retaining Pads.—Pads for the retention of the hernia are made of many shapes, and are usually interchangeable so that the fitter can make almost any combination of spring and pad In ordering pads it is only that he may desire (Fig. 16). necessary to state the form of spring they are intended to be used on, and suitable screws for attachment will be placed on them. For general use the best form is a moderately convex, oblong pad such as shown in Nos. 3 and 7 of the pads grouped on the accompanying plate. These oval pads are made in several sizes, as shown in the diagram of sizes (Fig. 17); using an unnecessarily large pad is a mistake most frequently This is especially true in the treatment of large sized The larger the pad, the stronger the spring pressure must be. With the smaller pad the pressure is concentrated immediately upon the spot, while if that same pressure is distributed over a large area, it ceases to be effective. A thin. flat pad answers well for a thin person, but upon a fat patient, a deeper pad, such as No. 8 of pad group, must be selected.

The pads are made either of soft material, felt, hair, or of hard material, such as wood, hard rubber, or celluloid. A soft pad that has proven useful is known as the water pad. This is made in every conceivable size and shape, and consists of a rubber bag filled with water or glycerine, sealed. Over this is a layer of felt and then a covering of silk, kid, or chamois. In some special cases this is a valuable pad, but its lack of durability is a serious defect. If the wearer is cautioned about its tendency to flatten out and leave him unprotected, it may save serious trouble. This change is so gradual that unless attention is drawn to it, it may not be noticed. For general use there is no pad made that equals in durability, cleanliness, and reliability, those made of hard rubber or celluloid. The skin maintains a much healthier condition under the pressure of a highly polished, impervious surface, than any soft material

# ABDOMINAL HERNIA.

Fig. 16.





that is constantly accumulating the excretions of the skin. Ordinarily the hard pad is equally comfortable to wear, if placed in proper position, and does not impinge upon the bone or other hard parts. The tissues back of the pad are soft and flexible, conforming readily to the shape of the pad, thus closing the upper part of the canal.

Truss Coverings.—The material with which a truss spring is covered has little to do with its efficiency, but may make much difference in comfort, cleanliness, and durability. Cleanliness of both person and appliance is the first essential of comfortable truss wearing, and it is for this reason that hard rubber and celluloid make the most desirable materials with which to cover truss springs and make the pads. In using these materials retaining pads can be made hollow, and therefore very light.

The use of hard rubber in truss-making was the invention of Dr. J. W. Riggs of New York City, about 1865, and was one of the most valuable contributions ever made in the interest of the truss wearer. The names of Riggs, Chase, and Hood, all reputable physicians, should long be remembered in connection with the great advance of this country over other nations in truss construction. Manufacturers are to be congratulated upon the excellence of their products, but we must still claim for the medical man the honor of having made the most valuable suggestions. In individual cases, especially in aged, thin, and sensitive people, it may be very advisable to have trusses constructed of the softest possible material, but for the average wearer there is nothing equal to the hard rubber or celluloid, which insures cleanliness, as they will not absorb the excretions of the skin. . They can be washed in water, or boiled if worn during contagious disease. Physicians frequently make the mistake of speaking of the "Hard-Rubber Truss" or "Celluloid Truss" as though they were some definite type of truss. This is an error, as these names merely refer to the materials used in construction and are applied by makers to every known type of truss.

#### CHAPTER V.

#### TRUSS-FITTING.

The fitting of trusses is an art that is difficult for a person to acquire who has no mechanical tastes or ability. man would seldom become an expert, but if persistent, would, with practice, do the work fairly well. It requires in addition to some mechanical skill, patience unlimited, persistence until the ideal is attained, and tact in managing the patient, especially if he is an old truss wearer and has "ideas" regarding his Unfortunately every beginner has had to acquire skill by personal experience, and when he has obtained this it has been considered shrewd business policy, by the non-professional expert, to impart as little of his knowledge as possible to others. There is no valuable guide to truss-fitting and largely because those who have written on hernia have had surgical experience only, while those who have had experience in truss-fitting have "bottled it up," fearing that their rivals might be benefited by it.

Truss-fitting consists of obtaining the measure and shape of the patient, selecting the truss suited to the case, shaping of the spring, and its application to the patient. The patient should also be instructed in the reduction of his own hernia, in the removal and readjustment of the truss, in the necessity of care and cleanliness of the skin, and last, but not least, in the importance of returning for refitting and inspection.

Taking Measure and Shape.—Every person is differently formed, even though the circumference be exactly the same, so that it is equally as important to consider the shape as the measure. Manufacturers can only follow one general shape for a certain size, therefore, if a patient buys a truss from stock that fits him, it is because he happens to fit the truss. Practically each truss should be shaped to the form of the person that is to wear it, and recognizing this fact, truss makers temper their

springs so that they can, with care, be bent to the required form with little risk of breaking.

The measure for a truss (Fig. 18) for inguinal hernia should be the entire circumference of the pelvis, about level with the internal ring, passing midway between the crest of the ilium and the trochanter major, and with the tape a little higher in the back than in front, corresponding with the pelvic obliquity.





Showing location in which measure should be made for inguinal truss. Tape should pass midway between trochanter major and crest of ilium. (Macready.)

This measure should be recorded in number of inches, and follows the line properly covered by the truss spring as shown in Fig. 13. It is also well to record the measure from one inguinal canal to the other in double hernia in order to locate the pads at a proper distance apart, remembering that in direct hernia the pads must be nearer together than in the oblique form. DOUBLE TRUSS GROUP (Continued).



7. Elastic web and spring truss.



8. Adjustable French truss.



9. Double elastic truss.



10. Double German truss.

reason alone, many truss sellers have declined to carry them in stock. The physician should impress upon his patient the truth, that to the ruptured man a good truss, well fitted, is more important to him than his clothes. Undue economy in this connection is poor policy.

Unclassified Group.—There is also a group of trusses that cannot be classified with any of those already mentioned. It contains one (No. 1) upon which I have never looked with much favor though I have known good truss fitters unbiased by personal interest, who claim to have found it satisfactory. Large numbers have been sold to dealers throughout the country, and for that reason it seems best to mention it here. It has the appearance of an original type of truss, and I believe the makers considered it such, but as a matter of fact Dr. Tod of London, England, patented (about 1858) a truss to which this is exactly similar except in details of construction, his being made of a steel spring occupying exactly the same position as this, held in place by a similar band, while this is made of spring brass, or other wire, so shaped that one piece forms not only the spring, but the frames for both the front and back pads. The advantages of this truss are in its extreme lightness and small cost of construction. Its disadvantages, as they present themselves to me, are its great liability to become displaced, lack of durability and general inefficiency. Its retention in place is absolutely dependent upon the web band which surrounds twothirds of the hip. Furthermore, the length of the spring, from the crest of the ilium to the hernial pad in front, is such, that in bending forward the pad is forced down over the pubic bone. Wearers have complained to me in reference to this as a great inconvenience, and it is certain that any truss pad that is so liable to displacement, must be looked upon as very dangerous.

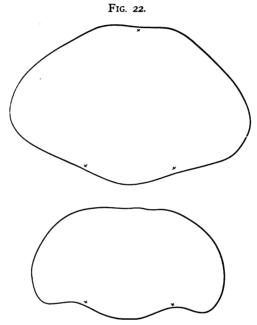
Nos. 2 and 3 of this group represent a combination of a short steel spring with an elastic band. It is a modification of, and I should think something of an improvement upon, the elastic truss.

**Double Truss Group.**—This group merely presents the same type of trusses already illustrated, as arranged for double instead of single hernia.

Retaining Pads.—Pads for the retention of the hernia are made of many shapes, and are usually interchangeable so that the fitter can make almost any combination of spring and pad that he may desire (Fig. 16). In ordering pads it is only necessary to state the form of spring they are intended to be used on, and suitable screws for attachment will be placed on For general use the best form is a moderately convex. oblong pad such as shown in Nos. 3 and 7 of the pads grouped on the accompanying plate. These oval pads are made in several sizes, as shown in the diagram of sizes (Fig. 17); using an unnecessarily large pad is a mistake most frequently made. This is especially true in the treatment of large sized The larger the pad, the stronger the spring pressure must be. With the smaller pad the pressure is concentrated immediately upon the spot, while if that same pressure is distributed over a large area, it ceases to be effective. A thin, flat pad answers well for a thin person, but upon a fat patient, a deeper pad, such as No. 8 of pad group, must be selected.

The pads are made either of soft material, felt, hair, or of hard material, such as wood, hard rubber, or celluloid. A soft pad that has proven useful is known as the water pad. This is made in every conceivable size and shape, and consists of a rubber bag filled with water or glycerine, sealed. Over this is a layer of felt and then a covering of silk, kid, or chamois. In some special cases this is a valuable pad, but its lack of durability is a serious defect. If the wearer is cautioned about its tendency to flatten out and leave him unprotected, it may save serious trouble. This change is so gradual that unless attention is drawn to it, it may not be noticed. For general use there is no pad made that equals in durability, cleanliness, and reliability, those made of hard rubber or celluloid. The skin maintains a much healthier condition under the pressure of a highly polished, impervious surface, than any soft material

of the wearer. This method so far simplifies truss-fitting as to place it within the reach of every practitioner who is willing to devote the time necessary. The patient should be, and usually is, willing to pay for this time in order to be relieved of a very dangerous condition. The two diagrams shown (Figs. 21, 22) are reproduced from those of two taken from my case book of



Diagrams of two persons whose circumference is identical.

two persons of exactly the same measure, and illustrate at once how impossible it would be for one to wear with comfort a spring shaped for the other.

Shaping.—In truss-fitting one should have a pair of strong pliers, a screw-driver, and a pair of good hands, the latter being the most important part of the outfit, as nearly all of the actual bending of the spring should be done by them. The bending into the required shape of a tempered spring must be done carefully and not by a sudden, jerky force. Grasp the

spring firmly in the hands as shown in No. 3, Fig. 23, and by a steady, firm pressure gradually bend it to the point required. In shaping by the diagram, begin at the point over the hernia and shape first across the front of the abdomen, if a cross-body truss, and then around the hip and across the back. If the spring crosses the back it must not be allowed to press upon the spine, but the pressure should be taken up by the heavy side muscles. If the lower edge of the spring needs twisting farther in or farther out to change the bearing of the pad or improve the fitting of the truss, this should be done by the pliers. It must be remembered in fitting a spring to the diagram, that allowance must be made for pressure. The spring must be forcibly held out to the shape of the diagram.

All springs covered with hard rubber must be thoroughly warmed before attempting to bend them, otherwise the rubber covering will crack, damaging seriously the durability of the truss. The warming is done by passing the spring rapidly through a gas flame (No. 1, Fig. 23), or through the flame of an ordinary spirit lamp. The latter method is the best, as the gas flame smokes it and unless constantly wiped will soil the hands or patient's body. The skill necessary for this warming process is quickly acquired, and all that is necessary to prevent burning, is to keep the spring constantly moving. equally good way, when convenient, and one free from danger of burning, is to dip the spring in boiling water for about one minute. Celluloid springs do not need warming before bending, except to see that they are not extremely cold. They must not, under any circumstances, be placed in a flame. readily distinguished from hard rubber, which is always black, by their being pink or white. Ordinarily this material is sufficiently flexible to stand any necessary shaping. It is only when the springs have been kept long in stock that they become somewhat brittle, and then the pouring upon them of boiling water will prevent cracking.

Every time a truss spring is bent its pressure is somewhat reduced, and for this reason it is best to start with a spring that

### ABDOMINAL HERNIA.

Fig. 23.



I.



2,



Shaping truss springs.

Shaping truss springs (Continued).



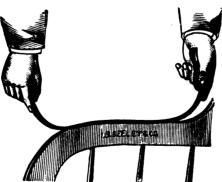
4



5



6.



is somewhat stronger than needed. Its pressure can be reduced by taking it firmly in hand and stretching out (Nos. 6 and 7, Fig. 23), or bending it over the arm of a chair. Caution is necessary not to reduce its strength too much, as it is easier to decrease than increase it. Its pressure may be increased, however, by adding to its curves, by short, firm bends between the hands, or curling up the spring as shown in Nos. 4 and 5, Fig. 23. If increase of pressure obtained this way is considerable, it will be to quite an extent transient, and it is usually better to exchange for a stronger spring. It is to be remembered that all hard-rubber covered springs must be warmed before bending, but that this is not necessary in shaping celluloid or leather covered springs.



Hard-rubber cross-body truss applied to complete oblique hernia. In small hernia the pad may be higher.

#### SELECTING TRUSS.

Oblique Inguinal Hernia.—An incomplete or a small complete oblique inguinal hernia is usually retained by a very moderate pressure and a small pad, which should be either directly over the internal ring or upon the canal immediately beneath that point. It is more difficult to select a truss exactly suited to the treatment of a small hernia, from the stock of the average dealer, than it is for a large hernia. This is because many dealers will have nothing to do with a light truss spring, believing that its virtue is dependent upon its strength. Of the

trusses carried in stock by the dealers, few will be found better for a small and recent hernia than a light spring cross-body, preferably with a hard-rubber or celluloid covering (Nos. 2, 3, and 6, cross-body group). If the spring seems too strong, reduce its pressure in the manner already described, while shaping it to the diagram of the patient. When applied it should occupy the position shown in Fig. 24, or still better,

FIG. 25.



Woman aged 40 years, with right labial hernia of seventeen years' duration.

with the pad a little higher. The pad as there shown, compresses the entire canal, while in a small oblique hernia it is only necessary to compress its upper part. The higher the pad, with retention of the hernia, the greater the comfort of the wearer, and the greater will be the improvement obtained from its use. Fig. 25 shows a large labial hernia retained, in Fig. 26, by a hard-rubber, cross-body truss. The pad should be about No. 3 or 4 oval (Fig. 17) and moderately convex. Some

manufacturers make what they call a narrow-spring cross-body, which is particularly well suited to light cases.

The next choice in such a case would be a light Hood truss, and if very light, is to be preferred even to the cross-body (Fig. 27). If the meager stock of the dealer makes it necessary to select a Chase type of truss, select a size smaller





Right labial hernia retained by hard-rubber cross-body truss.

than called for by the measure, and straighten out its neck nearly parallel with the spring (No. 3, Chase group), and shape by diagram. The smaller size is suggested because in turning the neck nearly parallel with the spring, the latter is thereby lengthened. The most objectionable feature of this type of truss is in the length of its neck, and low bearing of the pad. If driven to the necessity of putting on a truss of the French or elastic type, let it be for temporary use until a better form can

Fig. 27.



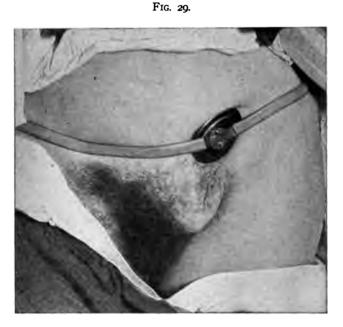
Hard-rubber steel-spring Hood truss with pad on spiral spring. For double or single hernia. This arrangement of pad is better suited to fat than to thin people and where strong pressure is required.

Fig. 28.



Complete oblique inguinal hernia. Recurrent after operation by MacEwen method.

be obtained, for under the permanent use of an inferior truss, small herniæ are quite sure to grow worse. Fig. 28 shows an inguinal hernia in a woman of middle life that would require a cross-body spring of more pressure, or what was believed better in this case, a Hood truss, as shown in Fig. 29. This is a very light form of the Hood truss and, in some cases, might



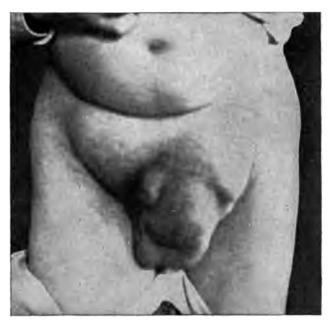
Same as Fig. 28, with De Garmo-Hood truss applied. Hernia is perfectly held within the abdomen. Bulging over pubic bone is from a thickened sac and loose skin.

not be sufficiently strong to retain the hernia perfectly, and it would be well to use the regular Hood form with steel springs, as shown in Fig. 27.

As oblique inguinal hernia increases in size there is a corresponding shortening of the canal, by the dragging down of the internal ring, until it is nearly opposite the external, thereby increasing the difficulties of treatment. Instead of having a canal an inch and a half long to act upon, we then have a large hole beneath the skin leading directly into the abdominal cavity.

In addition to this direct opening, there is usually a thickened sac, in these neglected cases, that also prevents in a measure the efficient action of a truss. Then again the pad must rest nearer the pubic bone, and this, by pressing the cord or other tissues against the bone, adds seriously to the discomfort of the patient.





Large double hernia. Protrusion on the left not complete when photograph was taken. Size of patient's head when fully out.

Even in these extreme cases the Hood truss arranged with deep pads (Fig. 27) is an excellent truss. Fig. 30 is a photograph of enormous double scrotal hernia, which was retained by a Hood truss of the ordinary type, as shown in Fig. 31.

In order to clearly comprehend proper and inferior forms of truss, it is advisable to compare this with what the Germans call a "Scrotal-Hernia Truss.' In the latter there is an enormous compress over the pubic bone held in place by a

strap between the legs. The amount of pressure necessary to retain the hernia, by such a large surface, must necessarily be great. In these enormous herniæ I have for many years held as a last resort, the truss known as the "Radical-Cure Truss" (Nos. 4, 5, and 7 of cross-body group). This will many times retain a hernia upon which every other form of truss





Same as Fig. 30. Hernia retained by double steel-spring hard-rubber Hood truss.

has failed, but it should be used only as an extreme measure, as it is most uncomfortable. Its peculiarity is in the construction of the retaining pad, which has a small, hard, oblong centre, surrounded by a soft-rubber or kid-leather ring. In action the greater amount of pressure is concentrated upon the small central pad, and to this, and the fact that they are usually made with an especially strong spring, is to be attributed their greater retaining power. The name had its origin in the

fact that it was advertised for many years by its originator under this title. That it possessed any special virtues, implied by its name, is not believed, except that it retained hernia securely and was skillfully applied by its inventor. Fig. 32 shows half of one of the double Radical-Cure trusses applied in combination with half of an ordinary double hard-rubber truss. The single truss should always be of the cross-body type. Some makers have attached this pad to a French spring, but this combination is practically worthless.





Hard-rubber radical-cure truss on right side, combined with ordinary double hard-rubber truss on left.

In fitting these large and neglected cases, it must be remembered that the canal is destroyed, and that the point of greatest pressure must be very nearly over the external ring and consequently nearer the centre of the abdomen than it would be applied in small oblique hernia. In many of these large herniæ the use of the water pad, which can be combined with any form of spring, will be found to retain better than the smooth, hard pad. When the water pad is used, it should, if possible, be changed to the hard pad as soon as sufficient improvement warrants it, for, while valuable, they are not very durable and therefore need to be watched. Under proper

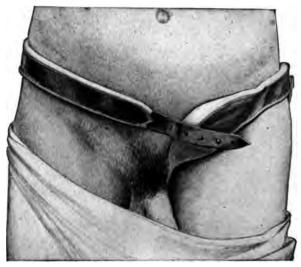
treatment, that is, perfect retention and gradual reduction of pressure, large oblique herniæ improve in almost every instance. This improvement is sometimes so great, that if the patient allows a protrusion of the hernia, he may be unable to reduce it, and serious results ensue. Patients under treatment for large herniæ must be particularly cautioned regarding this danger, and advised never to stand without a truss on.

In the Author's experience there have been very few reducible herniæ, even of enormous proportions, that could not be controlled by a suitable truss properly adjusted, and he has relied largely upon either the Hood form or cross-body spring, with such variations of pad as seemed to be required by the peculiarities of the case. The retention of these herniæ must be undertaken seriously, and not considered as trifling cases to which a truss can be applied and the patient sent away. It has frequently happened that patients, coming from a distance, have been sent away unattended until such time as they could be given the uninterrupted attention necessary to successful treat-This course might entail a delay of from five to ten days, or longer, with the patient in bed part of the time, if retention could only be accomplished in the recumbent position. Cases of this type that had previously met with repeated failure, managed in this way, have had the most gratifying results. It is true, now that the surgical treatment of these cases is so successful, that there is not the incentive to this persistent and hard work as in former years; still, there may be good reasons why an operation is not advisable, and they should under no circumstances be abandoned as hopeless.

When these enormous herniæ are reduced and retained, in the male sex, there remains a large mass of thickened sac and fascia as well as elongated cords and scrotum. It aids greatly in the retention of the hernia and adds much to the comfort of the patient, to adjust a firm and tight-fitting suspensory bandage. In people who have large, pendulous abdomens and flabby muscular walls, a light, but strong, abdominal belt will aid. Such belts are usually kept in stock by dealers, but it is far better, when possible, to have them made to order, as they usually contain rubber, which material rapidly deteriorates when lying unused. A group of these belts, and directions for measuring, will be found in the chapter on the mechanical treatment of umbilical hernia.

The English use, for cases of very large herniæ, what they term the "Rat-Tail Truss" (Fig. 33). It will be noted



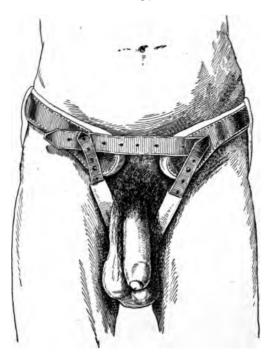


English "Rat-tail" truss. (Macready.)

that this truss is quite similar to the French type, except that it is vastly superior in that the direction of the pad is nearly continuous with the spring, bringing it directly over the canal, instead of over the pubic bone as in the German truss. The spring in this truss is also long enough to clasp the opposite hip, which greatly aids in holding it firmly in place. It is to be hoped that, eventually, our truss makers will abandon the patterns now used for making the French-German type and adopt those more nearly approaching the English design. The

advantages of the English truss are well shown in Fig. 34, as applied to double inguinal hernia; we believe, however, that with accurate fitting of the spring, the understraps, which are always objectionable, could usually be abandoned, and we can speak in praise of the position of the pads only. In contrast to this, attention is called to a truss of the same type (Fig. 35),





An English type of double truss, applied. (Eccles.)

very extensively sold in this country, which, while excellent in construction, has the serious defect of having the centre of the pad too far below the spring. This truss, as shown applied, is in very good position, except that the spring is too high. When the wearer stoops, the abdomen strikes the upper edge of the spring, and forces the pad down over the pubic bone.

Direct Inguinal Hernia.—The mechanical treatment of direct hernia is, in most respects, similar to that of the oblique variety, except that the difficulties are somewhat increased on account of its close proximity to the pubic bone. The contents of a direct hernia may sometimes account for truss-wearing being more painful. In direct hernia we may have the bladder, cæcum, or sigmoid flexure, forming part or all of the protrusion. In such a case pain is caused by direct truss-pressure upon the bladder or bowel. Several cases of sigmoid

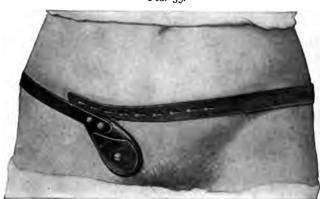


Fig. 35.

Hard-rubber French type of truss applied. The strap may be buttoned on stud-head at end of spring or on another below centre of pad. The latter is preferred. The tendency of this truss is to slip down over the pubic bone.

and cæcal hernia have been seen, that could not tolerate any form of truss pressure that was sufficient to retain the protrusion. In direct hernia a pad that is nearly circular in shape is frequently better than the oblong form. The water pad is particularly good, for, even if some pressure is made against the pubic bone, it does not cause the pain that a hard pad would. Whatever pad is used it must be placed nearer the median line, and lower, than for oblique hernia. Little or no improvement must be expected in direct hernia from truss-wearing. If the case is prevented from increasing in size and the patient is made fairly comfortable, it must be looked upon as successful.

### CHAPTER VI.

## MECHANICAL TREATMENT OF IRREDUCIBLE INGUINAL HERNIA.

In the author's early experience in the treatment of hernia, he devoted much time and work in attempts to convert these irreducible into reducible cases of hernia, and with a fair amount of success.

He would, however, strongly urge upon those who are doing truss fitting exclusively, to avoid any undue or prolonged manipulation, as quite liable to set up an inflammation that may prove very troublesome or even dangerous.

These remarks do not apply to those cases which are necessarily slow to reduce on account of the great bulk of the tumor, but to those cases where adhesions have formed between the inner surface of the sac and the contents of the hernia, and where pain and nausea are produced by manipulation.

It is not necessary to devote much space to this branch of the subject, as the proper treatment of irreducible hernia is by surgical, instead of mechanical means. There are cases, however, where from one cause or another operation is inadvisable and then the question of palliative treatment must be met. older works on hernia taught that it was dangerous to wear a truss pad over protruding omentum. Experience has so often disproven the correctness of this statement that it can be flatly The protruding contents of an irreducible contradicted. inguinal hernia are almost always omentum and intestine; the latter being reducible, and the former adherent to the sides or bottom of the hernial sac. Such a case is shown in the photograph, Fig. 36. Where the intestine is reduced it can, in many instances, be retained by strong truss pressure across the neck of omentum, where it passes through the canal. Such pressure may protect the patient against strangulated bowel. inconvenience that he will suffer will usually be that attendant · upon the wearing of an unusually strong truss. It seldom happens that pressure upon the neck of omentum does any serious harm, and in exceptional cases it has caused its absorption. In rare instances an inflammatory action has been set up, necessitating confinement to bed and application of an icebag for twenty-four or forty-eight hours, but nothing more



Fig. 36.

Large irreducible scrotal hernia. Intestine wholly reducible and could be retained by truss pressure. Subsequently cured by operation; large mass of hypertrophied omentum amputated.

serious has been seen. The case is certain to grow worse, even though protected against the dangers of strangulated hernia. The protruding omentum becomes hardened and takes on a condition of hypertrophy which may lead to its development to an enormous size.

In selecting a truss for these cases a strong spring must be used, usually of the cross-body variety of the ordinary type, or, still better, the radical-cure form. The water pad, aside from the fact that it is not durable, is a very good one. Many times, however, a deep hard-rubber pad, of good size, may be worn with equal comfort and prove far more serviceable. If the irreducibility of the hernia is caused by adherent omentum in the canal, that does not extend down to the scrotum and is small in quantity, then a concave pad will prove useful. In these smaller cases it is not uncommon for the adhesions to



Fig. 37.

The hinged-cup truss for irreducible hernia. (Macready.)

yield under the pressure of the truss and the hernia to become a reducible one. In such a case, where a concave pad has been used, it should promptly be changed to a convex one, in order to secure more perfect retention. The convex pad should be applied in every case where the protrusion can be reduced into the canal and is of small size.

Where a mass of omentum is adherent in the scrotum, and a truss pad has been applied across its neck, a good-fitting, strong suspensory bandage should also be constantly worn. The English use what they term a "Hinged-Cup Truss" (Fig. 37), which appears to combine the pressure of a regular truss pad with a concave cup over the protruding omentum. Macready says of it:

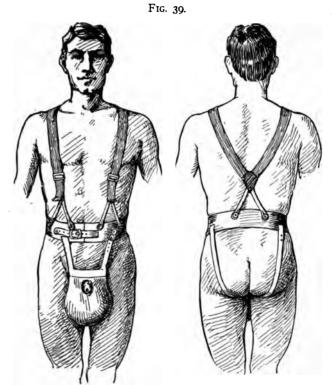




Enormous irreducible left scrotal inguinal hernia. Both intestine and omentum irreducible.

"It is seen to consist of two parts, of which one occupies very nearly the position of the pad of an ordinary truss and is not concave, and the other forms a scrotal portion, which is united to the former by a transverse hinge. The scrotal part is a three-sided frame of metal, covered in with chamois leather, curved to adapt itself to the distended scrotum. The apex of the triangle is downwards towards the perineum, and to it are attached the understraps, which are fastened to the side of the

truss just behind the shoulder, as usual. Every pull on the understrap presses the cup against the scrotum, whilst by means of the hinge, the movement is hindered from being conveyed to the pad." The author has had no personal experience with it.



Showing method of supporting enormous irreducible scrotal hernia, when no form of truss can be worn. The weight is transferred to the shoulders by a pair of suspenders.

Irreducible scrotal hernia of enormous proportions, such as shown in Fig. 38, in which truss-wearing is impossible, and when operation is inadvisable, should be protected by especially constructed supporting bags (Fig. 39). The bag should be made from measures carefully taken, while the patient is recumbent and with the tumor at its smallest. There should be a strong band about the pelvis to which can be buttoned an

ordinary pair of non-elastic suspenders passing over the shoulders. A support of this kind will, in a measure, prevent increase in size besides adding materially to the comfort of the sufferer. Such herniæ are pretty sure to cause the death of the patient eventually, and their operative relief should be seriously and immediately considered. It is true that danger attends such operations, but it must also be taken into account that the patient may be incurring a greater danger by declining it, besides almost complete disability.

### CHAPTER VII.

# MECHANICAL TREATMENT OF INGUINAL HERNIA IN INFANCY AND CHILDHOOD.

One-half of all abdominal herniæ occur during the first five years of life, and therefore come within the consideration of this branch of the subject. It may also be said that as regards treatment they form the most important, but by no means the most difficult cases. Important, because it is during this period that the defect must be cured, if this is ever to be accomplished without an operation. It is also important in the interest of the infant's good health, as it unquestionably affects the health and strength of the infant to a much greater extent than it does an adult.

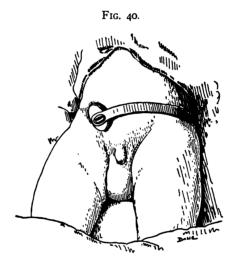
The mechanical treatment of inguinal hernia is not difficult, and there are very few, if any, surgical affections that should be so thoroughly under the control of the family physician. Infants are easier to fit than the adult, and they will be brought to the physician with greater regularity; there is freedom from many complications which arise later in life, and they prove of more interest because they are cured if properly managed.

Unfortunately, however, it is a fact that children are growing up to manhood and womanhood, carrying with them the herniæ of infancy because of lack of proper attention on the part of the family physician. The case has been brought to the doctor, and he has "prescribed" a truss, and recommended a druggist or instrument maker who deals in these articles. Having done this, he feels that he has discharged his whole duty to his patient, and gives the case no further thought. The dealer sells to the patient whatever truss he happens to be interested in, or has in stock, the case itself having little or no influence in deciding what form of appliance is to be worn; nor in the majority of instances is the instrument selected ever

shaped to the form of the infant who is to wear it. In fact, the baby is fitted to the truss and not the truss to the baby. The sale of the truss having been made, no one but the parents feel any further responsibility in the case, and this rests lightly with them in the belief that just the right thing has been done. If, by the merest chance, the truss was approximately correct at the time applied, this does not hold true a few weeks later, as the child is rapidly changing in shape and size. The parents know nothing of the advisability of frequently refitting the truss, the dealer's interest and responsibility terminated with its sale, the doctor is out of the case altogether by having referred to the dealer, and the result is the child goes without a cure. all wrong, and the wrong begins with the family physician who first sees the case and passes it into unprofessional hands. He should become at once as responsible for its cure as he would for a fractured femur or a dislocated hip-joint. If he cannot bring to bear upon it better knowledge than his own, then it is his absolute duty to do the best he can himself.

In a few of the larger cities truss makers have, by practice, acquired considerable skill in fitting, and when they have taken the trouble to familiarize themselves with the anatomy of the parts, and have no special hobby or patent of their own to exploit, they do good work; but the physician, already possessing the knowledge of anatomy and methods of diagnosis, will soon obtain by experience the necessary mechanical skill, and carry out treatment in a far more scientific manner than possible for an unprofessional man, no matter how honest the intentions of the latter may be. He would also find that not only would the parents fully appreciate his efforts in behalf of their child, but by the cures which he would surely obtain his reputation would be materially enhanced.

Fully 95 per cent. of the inguinal herniæ of infancy can be cured by careful mechanical treatment, but this must not be construed to mean the application of a truss, no matter how skillfully done, and the discharge of the case. It means taking the case under care and observation for not less than one year, or until a cure is effected. It is important to discover, when possible, the cause of the hernia in the infant. Of course, if due to congenital defect, time alone can remove it, but it will surprise a good many physicians to know how often the cause can be ascertained and removed. In this connection, I will again call attention to the frequency of hernia resulting from constipation, whooping-cough, tight belly-bands, and long-continued crying. Attention to, and, so far as possible, removal

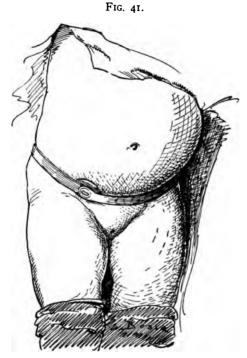


Five weeks old boy with right complete inguinal hernia and hydrocele of tunica vaginalis on the same side. Hard-rubber cross-body truss applied.

of, these causes is the first essential of successful treatment. This branch of the subject has already been considered under the cause and diagnosis of hernia.

The mechanical treatment of hernia in infancy is believed to be the better method, for the reason that many can carry it out who are not qualified to do a surgical operation, and that the final result is equally good. The general practitioner can, if willing to devote the necessary time, secure good results without the use of the knife. There are very few ruptured infants that cannot be cured by the family physician. State-

ments that operations are advisable on children because trusses cannot be worn, are born of absolute ignorance of the mechanical treatment of hernia; as a matter of fact, infants tolerate truss pressure better, if that pressure is intelligently applied, than do adults. It is unfortunate that almost all infant trusses are made entirely too strong, and if applied as sent out



Hood truss applied to child six months old.

from the factory, must cause pain, if not actual injury, to the delicate tissues. It is just here that the physician's knowledge and supervision is essential. Nor is it a fact that hernia cured by truss is more liable to recur than when the same result has been brought about by an operation. It has been a matter of surprise that so few of the many children who have been under personal care and cured during the past twenty-five years have

had a return of their ruptures. The recurrences have been wholly due to some violence, as whooping-cough, bronchitis, or some other cause, which would have been quite as likely to have produced hernia in a child who had never had it.

The age at which mechanical treatment may be begun is a question which many physicians are in doubt about, and one often asked in the lecture-room; the answer being that an infant old enough to be the possessor of a hernia is quite old enough to have the hernia treated (Figs. 40, 41, and 42).

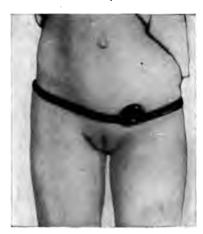


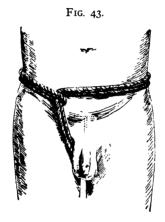
Fig. 42.

Cross-body hard-rubber truss as usually applied without perineal under-strap.

Trusses have repeatedly been put on babies ten days and two weeks old, and there has been no occasion to regret beginning treatment at this early date. It is an erroneous idea, and unfortunately a rather prevalent one, even with physicians, that a baby will "outgrow" this defect, or that it is "better to delay treatment until the child is older." It being conceded that it is advisable to begin treatment as soon after the development of the hernia as possible, the next question is as to the manner of supporting the protruding viscera. There is no bandage or makeshift of any description that will take the place, either for

comfort, cleanliness, or efficiency, of a carefully applied truss containing a metallic spring, and covered by material impervious to moisture, such as hard rubber or celluloid. Elastic bands, so-called elastic trusses, and bandages such as a "hank" of worsted (Fig. 43) have been recommended at various times; but they are a delusion and a snare, and usually an abomination.

There is no lack of good trusses in this country. The druggists of every town and hamlet in the United States are annually visited by representatives of manufacturers, whose



Application of a skein-of-wool truss. (Eccles) This is considered a very poor makeshift.

products are not equalled in any other part of the world, and still the number that are really suited for use on infants is very small, owing either to defects in the original design of the truss, or because of their being entirely too strong, even where the form of the truss is correct. All infant trusses which are made to apply from the side of the rupture, all of those where the pad is placed upon a descending arm at a level lower than the pelvic spring, and all trusses cushioned or padded with soft material, are condemned. The so-called French and German style of trusses, which comprise the bulk of stock of many druggists, should have become obsolete a half-century ago.

In truss selection the following points should be remembered: (1) The spring should be so tempered, if steel, that it may be readily bent to the shape of the child, and its pressure added to or diminished by increasing or removing the amount of curve which it possesses. (2) The entire truss should be water-proof, that it may be frequently washed and not damaged by urine. Any material which absorbs, and holds in contact with the child's skin, its excretions, will cause scalding and





Left complete inguinal hernia in child 8 years old, retained by hard-rubber cross-body truss with perineal under-strap. The latter is seldom required.

excoriation, besides being actually filthy. (3) The truss should be simple and durable. The more simple in design the better is the truss, as a rule. Pads with ball-and-socket self-adjusting action, so-called, or with complicated set screws for adjustment, are entirely unnecessary and soon become useless.

For the treatment of single inguinal hernia, in the infant, the cross-body spring, which, from the pad, crosses the front of the abdomen, passes around the hip of the opposite side, and across the back, is one of the most valuable appliances that can be used (Figs. 40-44). This truss can be obtained of

almost every druggist in the country, the spring is covered either with hard rubber or celluloid and known in the trade as the "cross-body" truss. A spring of this kind will surround about two-thirds of the pelvis, and while it is supplied with a strap to complete the circumference, it readily holds itself in place whether the strap is used or not. Its pressure can readily be adjusted to the requirements of the case by increasing or diminishing the curve of the spring. Those covered with celluloid have the advantage of being readily shaped to the





De Garmo-Hood truss, German silver spring, hard-rubber cover. Applied to small right oblique inguinal hernia.

form without heating (which is necessary in shaping the hard-rubber springs), but have the disadvantage of being not quite so durable as those with the hard-rubber covering.

The "Hood" truss, covered by celluloid or hard rubber, is made in infant sizes and kept by most dealers, and forms an extremely desirable truss for children whose pelvic measure exceeds sixteen inches, but is not desirable in those of smaller size.

The De Garmo-Hood truss (Fig. 45, 46) differs from the others in having a spring of German silver instead of steel, the

covering being of hard rubber. This material for springs in this form of truss has proven very valuable, owing to its being readily shaped to form without liability of breaking, and because of its not having the action of compression found in the steel spring. This truss has been extensively used in my private work. Manufacturers have told me that they could not sell it to the dealers because it was considered too light, and this clearly indicates how little the dealers comprehend the requirements of a proper truss for infants.

Fig. 46.



Right complete oblique hernia in boy of 8 years. Retained by De Garmo-Hood truss.

The measure for selecting the size of the truss should begin just above where the hernia is seen; that is, at the internal abdominal ring, passing around the hips midway between the crest of the ilium and the trochanter major. This, in number of inches, will indicate the size of the truss required. In the shaping of the spring, the diagram method, previously described, will be found of the greatest service. The diagram is used instead of the child. If a spring covered with hard rubber is used, it should be passed through the flame of a spirit lamp until it is quite warm, and it can then be bent to the exact shape

required. As before stated, and it cannot be repeated too often, most infant trusses, as sent out from the shops, are too strong in pressure, and this should be carefully guarded against. Only a light pressure is required if the location of the pad is at the right spot. A very common, almost universal, error, in applying trusses, especially to infants, is in putting the pad too low (Fig. 47). If the pad rests on the pubic bone its efficiency is at once destroyed and the discomfort of the child is assured.





Boy of 12 years wearing the German type truss. Fitting on right side good, on left bad, owing to the use of what the truss makers call a scrotal hernia pad. In this case, omentum was adherent in scrotum.

It should be borne in mind that the design of truss-wearing is to keep the bowel entirely within the abdomen, and in order to accomplish this perfectly, the supporting pressure must be very nearly over the *internal* ring. The descent of the hernia, stopped at the external ring, may in this way be kept out of sight, but still occupies the upper part of the canal, and a cure will never result. A truss pad that rests against the bone cannot thoroughly protect the upper part of the canal. It is held away from it, and the child is made uncomfortable.

When the truss is fitted high the parts back of the pad are soft and yielding, and discomfort is not caused.

Having fitted the truss, the care of the case has only just The case must be kept under observation and the truss changed in shape and size as the child grows. change and growth is very rapid, and the child should at first be seen at least once a week, and not allowed to pass entirely from care until it is cured. In case of whooping-cough or severe bronchitis supervening, it is advisable to increase the truss pressure temporarily, but otherwise, after the first three months, it is well, if the hernia does not protrude, to begin to reduce the pressure. One year is the shortest period that a truss should be worn, and it should never be removed by the mother except for purposes of cleanliness, and this should be while the child is in a quiet and recumbent position. Absolute cleanliness must be insisted upon, and if the skin is kept clean and dry, it will tolerate strong truss pressure without abrasion. The free use of a good talcum toilet-powder is quite essential to the comfort of the infant truss wearer. After the careful cleaning and drying of the parts, it should be freely applied to the skin before placing the pad. Several good powders are on the market, or the formula given under general instructions, which was devised for this purpose many years ago and which has stood the test of time, may be used. Where an abrasion has once occurred and is slow to heal, on account of constant wetting by urine and the irritation of the truss, I have found nothing better than balsam of Peru.

As previously stated, the truss should be kept on for a period of one year; if, however, the case has been one of congenital hernia, it is best to prolong the wearing for two years. The truss pressure should be gradually lightened, until, during the last six months, it serves merely as a protective support against the recurrence of the hernia. If a strong truss were worn during the same length of time and then entirely removed, there would be a far greater liability of the return of the trouble. Attention to the child's general condition should

not be overlooked. Constipation must be prevented and the digestive apparatus looked after. It adds greatly to the difficulties of controlling hernia if the intra-abdominal pressure is increased by flatulent distention of the intestines.

Among the complications mentioned, fluid in the tunica vaginalis is, perhaps, the most common and certainly the most perplexing. This fluid, which is usually reducible to the abdominal cavity through the neck of the tunica, may be present when the case first comes under observation, but more frequently forms during treatment. It occurs in many cases of congenital hernia, usually from one to two months after treatment has begun. The parent will bring the child back and tell you that the rupture is not as completely held by the truss as it formerly was, and that it is down almost all the time. The means of distinguishing this from the hernia have already been mentioned.

As regards treatment, it is best to let the fluid alone except in some rare instances where its quantity is so great as to inconvenience the child. If it ceases to return to the abdomen, indicating that the communicating neck has been obliterated, forming true hydrocele, it is well enough to tap with a small trocar, and this is usually sufficient to produce a complete cure. If from any cause the child has an effusion of fluid within the abdominal cavity and also has hernia, the fluid will fill the hernial sac. In cases of this character truss pressure should be continued in order to protect the tissues about the canal. The fluid cannot be retained by any form of truss.

Non-descent of the testicle, associated, as it usually is, with hernia, requires careful consideration. We should never fail to examine carefully the scrotum of the ruptured child. It is not uncommon to see boys of eight and ten years old in whom it has never been discovered that only one testicle was present in the scrotum. In infancy this defect is likely to be overlooked, or, what is worse, if the testicle lies just outside the external ring it is mistaken for hernia, reduced, and kept back by a truss. When the testicle is in the canal, treatment will,

in many instances, have to be delayed until it passes the external ring; then a small pad may be applied over the upper part of the canal.

In giving mechanical means the first place in the treatment of hernia in infancy, I do not wish to be understood as disapproving surgical measures. On the contrary, I believe that it is as justifiable to operate for the cure of hernia in a child as it is for the cure of clubfoot or other malformations. If by mechanical means we cannot correct either, it is our duty to operate. In clubfoot there are cases which an experienced orthopedic surgeon could confidently state would never be cured by mechanical appliances, but this is scarcely ever true of hernia, some of the most extreme cases in infancy yielding promptly and a permanent cure resulting without the use of the knife. This being true, beyond all question it is our duty to try the mild means first. If this is faithfully carried out, it will be found that few cases remain requiring operation.

# CARE OF SKIN AND GENERAL INSTRUCTIONS TO TRUSS WEARER.

It is a matter of the utmost importance that the trusswearer be instructed how to care for the surface of the skin under the bearing of the truss pad, as it will save him much dis-He must also be taught how to put on and take off his truss and cautioned regarding the danger incurred by going about without it, even while in his own room. It is best that he should also know how to reduce his own hernia and how to act in case he finds this impossible. The fatality attending strangulated hernia is in many instances due to the ignorance of the patient regarding its dangers. The first essential to comfortable truss-wearing is that the skin pressed upon by the pads shall be kept strictly clean and dry. Not only must the skin be kept clean, but the truss itself must be frequently washed. Besides the keeping of the parts clean, it has been found desirable to bathe the skin frequently with equal parts of alcohol and fluid extract of hamamelis leaves; following this, after drying, by the application of a good, mildly antiseptic powder. The author has found nothing superior in the way of a powder to that published by him many years ago, which was designed for this special use, and the formula of which is here given:

R Amyli Ziv
Cretæ Gallicæ (powdered French chalk) Zii
Alum, ust.,
Acidi boracic, äā Zii
Acidi carbolici,
Ol. limonis, äā Zss
M. Sig.—Powder very fine.

It should be made into a very fine powder and used by dusting the parts freely beneath the truss pad. As a toilet powder, for general use on infants, this will also be found superior to those commonly on the market.

If the skin has been broken, or suppuration has occurred beneath the truss pad, as it sometimes will, balsam of Peru has been found useful. In slight excoriations the use of benzoated oxide of zinc ointment heals the surface quickly. Its action is especially good, on infants, where the skin lesion is started by urine getting beneath the truss pad. If there is suppuration, the pus should be washed off thoroughly with a solution of hydrogen dioxide and the Peruvian balsam freely applied. Healing may frequently be accomplished in this way without confinement to bed or the discontinuance of the use of the truss.

There should be no compromise with a patient who suffers from a well-developed hernia, on the necessity of continuous truss-wearing. If for any reason he is obliged to discontinue its use temporarily, safety demands that he should maintain the recumbent position until such time as he can resume his truss. The man who has retained his hernia by a truss, for a time, and then discontinues its use, is in greater danger of strangulated hernia than he who has never worn one.

Trusses worn by adults should be removed at night after the patient is in bed, being reapplied in the morning before getting up. If the patient has a persistent cough, or the hernia is so large that protrusion occurs while lying down, then a special night truss should be provided. The elastic truss is best suited for this use. He should understand that the truss suitable for night use is worthless, even dangerous, for day use, and that a truss suited for day is unfit for use at night. Also that, in a measure, he is disabled for life, or until cured, and that he must remain under the observation of his physician. A properly selected and good-fitting truss restores him, for the time being, to normal condition. Owing, however, to changes in his shape, changes in the truss, or bad habits formed in the wearing of a good truss, he should, for safety, submit himself to frequent inspection.

A convenient way to instruct my patients has been to hand them a printed slip containing the following:

#### INSTRUCTIONS TO TRUSS-WEARERS.

Apply your truss before rising in the morning.

Before applying, be sure that none of the hernia is protruding. Remove the truss after getting in bed at night; if correctly fitted, it will need no attention during the day.

In extreme cases a night truss may be needed. The one provided for day wear is unfit for such use.

Infants and young children should wear the truss both night and day.

Never go about your room without truss on.

In taking shower bath keep truss on.

Wash the truss-water will not harm it.

Extreme cleanliness will add to comfort.

Bathing the skin at night with equal parts of alcohol and extract of witch hazel will reduce irritation.

The free use of a good talcum powder in the morning is advised.

It is not safe to wear the truss over your underwear.

Any unusual abdominal pain or discomfort should lead you to examine your hernia. If protruding, it should be at once replaced and the truss readjusted. This should be done while lying down if possible. If replacement of hernia is impossible and pain is severe, apply an ice bag and send for physician. Delay is dangerous.

### CHAPTER VIII.

### MECHANICAL TREATMENT OF FEMORAL HERNIA.

In no form of abdominal hernia is prompt and efficient treatment more important than in that variety known as femoral, nor is there any form where more difficulty is experienced in carrying treatment into effect. This refers more especially to its palliative or truss treatment, and is due to the extreme difficulty of producing sufficient pressure over the deep-seated femoral opening to prevent a protrusion through it without making intolerable pressure on adjoining important nerves and blood vessels. Furthermore, even if the exact compression of the canal has been obtained, nothing but the most careful and accurate fitting of the truss spring will maintain the location of the pad. It is easily displaced by the motions of the leg, upon the muscles of which its lower edge necessarily rests, or by the folding over of the abdominal wall against its top.

For these reasons, and for the additional reason that femoral hernia is never cured by truss-wearing, no matter how young the patient nor how recent and small the hernia, this form should always have the benefit of present-day surgery and be cured, unless there is some other physical condition which is contraindicative. This statement is not intended to convey the impression that there are not hundreds who go through life and escape accident, but it means that they are much more liable to accident and experience greater inconvenience from truss-wearing than those who are afflicted with inguinal hernia.

What has been said of truss-fitting in general, the taking of a diagram of the pelvis, which is especially important in these cases, and the shaping of truss springs need not be repeated here.

## ABDOMINAL HERNIA.

GROUP OF TRUSSES FOR FEMORAL HERNIA.



1. Chase femoral-hernia truss, hard rubber.



2. Chase femoral-hernia truss, cedar pad, leather cover.



3. Double, hard-rubber, extension-neck truss.



4. Hard-rubber cross-body truss.

GROUP OF TRUSSES FOR FEMORAL HERNIA (Continued).



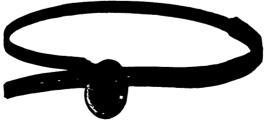
5. Cross-body truss applied for femoral hernia.



6. Chase hard-rubber truss.

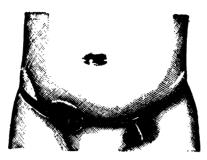


7. French truss with perineal strap.



8. Foster ratchet truss, hard rubber.

## GROUP OF TRUSSES FOR FEMORAL HERNIA (Continued).



9. Hood truss modified for femoral hernia on left side.



10. Double hard-rubber truss. Made for inguinal hernia; good form for femoral.



11. French truss, leather and hard rubber.



12. Extension neck hard-rubber cross-body truss.

GROUP OF TRUSSES FOR FEMORAL HERNIA (Continued).



13. Turn-pad hard-rubber truss.



14. Chase hard-rubber femoral truss.



15. Adjustable French truss, hard rubber.



16. Elastic truss.

One of the most important points in selecting a truss for femoral hernia is that its retaining pad shall be small enough to fit into the deep femoral space without impinging upon the spine of the pubes at the inner side or upon the femoral vessels at the outer side of the hernial opening. The pad should be





Cross-body hard-rubber truss with water pad. Applied to right femoral hernia.

narrow, not too long, and deep enough to sink well into the femoral space immediately beneath Poupart's ligament; having a pressure backwards towards the thigh, and slightly upwards. The pad shown in no. 4, well answers this purpose, in a thin person, and has been much used on them by the author. If, however, the patient is at all fat it is not sufficiently deep.

## MECHANICAL TREATMENT: FEMORAL. 109

A small sized but prominent water pad (No. 4) is very comfortable in these cases, but should be used only on those who can be relied upon to report for inspection with regularity,

FIG. 49.



Cross-body hard-rubber truss with deep pad, for femoral hernia.

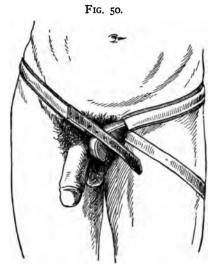
owing to its perishable character. These pads are liable to flatten out in two or three months' wear and must be renewed. This change of shape is particularly dangerous in femoral hernia, as the pressure then comes upon Poupart's ligament or the spine of the pubes and is held away from the hernial opening.

Fig. 48 shows applied, a form of truss known in the trade as a hard-rubber cross-body spring, with water pad, and the combination forms a most excellent truss for femoral hernia. The small hard-rubber pad is usually preferred. when properly fitted, can be worn without the perineal strap always so objectionable. This is especially referred to as it is kept in stock by nearly all truss dealers and is therefore readily within the reach of most practitioners. As found in the market, it is designed and shaped for use in cases of inguinal hernia, but the modifications necessary to transform it into a femoral hernia truss are easily made. In selecting a spring, secure one with the lightest obtainable pressure, as femoral hernia never requires as strong pressure for its retention as inguinal. Then select the smaller pad, as the one ordinarily used on the spring is too large. Such a pad will usually be found in the stock of the dealer on the youth's size of inguinal truss, and can be easily transferred to the spring selected. The essential changes now to be made are as follows:

- (1) Changing the uniform curve across the front of the spring so that the pad will rest flat against the femoral space. In making this change warm thoroughly the rubber that covers the spring by passing it through the flame of a spirit lamp, or by putting in boiling water, and then bend the spring with the hands or pliers, being careful not to bend it too near the screw hole.
- (2) In the shaping of the spring it must be lengthened in front so that it reaches over against the thigh. In the general fitting, the method of making a diagram described under the article on inguinal hernia must be followed closely, as in this way, better than any other, can accurate adjustment be secured.

The cross-body spring passes around the hip opposite the affected side (as shown in Fig. 49), just above the trochanter

major, in very nearly the position occupied by the inguinal hernia truss; the pad is placed about one inch lower, its lower edge resting upon the top of the thigh. The spring must be about half an inch longer in front than when used for inguinal hernia. Some of the trusses known as the French (no. 7 of group) or German style (Fig. 50) are very good for femoral hernia. The two styles named are alike except that the "French" are lighter in construction and therefore better



German femoral truss applied. Note that direction of pressure of the pad is towards the spine of the pubes instead of into the femoral space and towards the thigh. Good illustration of poor truss-fitting.

adapted for femoral hernia. If this truss is carefully shaped by the diagram method it can usually be successfully worn without the perineal strap, but if it fails to maintain an exact position, it must be worn even though irksome. The spring in this truss does not pass across the abdomen, but goes around the hip of the affected side. The English form of this type is even better on account of its having a smaller pad (Fig. 51).

Springs that go on from the side of the hernia, like the German, French, and English type, are better suited to femoral

than to inguinal hernia, as the curve of the spring brings the direction of pressure toward the thigh. The truss known as the "Chase" is of this type and is very good. Some inguinal trusses with adjustable pads known as "Common Sense" and "Excelsior" trusses,—very similar in design,—are also good for femoral hernia if the spring pressure is sufficiently diminished. One is shown in Fig. 52.

FIG. 51.



Light form of femoral truss, English form. (Macready.) Illustration of good-fitting truss.

Several manufacturers have modified the "Hood" truss for use in femoral hernia, but in my own hands it has not proven as satisfactory as those of the cross-body type. A truss of the latter type, designed by me many years ago, is shown in Fig. 53. This has a light cross-body spring, the pad being supported on an arm, which is in turn attached to the spring by a ratchet. There was also a slot in the face-

plate of the pad that allowed of adjustment. Between the ratchet and the slot very accurate adjustment of the pad could be obtained.





Adjustable truss made for inguinal, also suitable for femoral hernia.

The Elastic Truss is strongly advised against as being both unreliable and uncomfortable. The author has seen cases which have become strangulated, and many others which have increased in severity under its use. Nor has the author ever

The private out a properties of the least legree of the private out a common terms. I me is not at hand, and the private out a properties of the southern the comments of the





De Garmo femoral truss.

temoral space is somewhat protective and should be used only until something better can be done.

In double femoral hernia the choice of truss should be between the "Double French" and the double hard-rubber

truss shown in no. 10 of group, the latter with small pads being very much preferred. This truss is made for inguinal hernia and the curve at the end of the spring must be modified in order to have the pads rest flat upon the thigh. It seldom requires the thigh strap to keep it in position. Fig. 54 shows a truss of this type applied to an inguinal hernia on the left side and femoral on the right. This combination has proven thor-





Woman of 45 years with right femoral and left inguinal hernia retained by double hard-rubber truss and water pads. The latter are for temporary use only, the hard-rubber pads being better.

oughly satisfactory in many cases. A smaller pad than the one shown in this photograph was put on later.

Irreducible femoral hernia should rarely be treated mechanically, as the only safety in these cases is in operation; in some cases, however, the attending circumstances are such that operative means cannot be carried out and some substitute must be used. If the hernia is small a concave pad may be used, preferably on the cross-body spring. Usually in such cases the perineal or thigh strap is necessary to keep the

pad in place. The contents of irreducible femoral hernia is almost uniformly omentum, and in a few instances the author has seen its absorption occur under the pressure of a concave pad, and has then changed to the convex pad generally used in femoral hernia. The idea advanced in some of the older works upon this subject that it is dangerous to make truss pressure upon irreducible omentum has been too often disproven in the experience of the author to allow of anything but the most emphatic denial.

### CHAPTER IX.

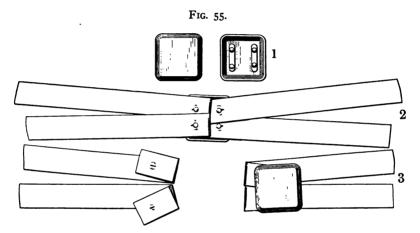
# MECHANICAL TREATMENT OF UMBILICAL HERNIA.

The discussion of the treatment of umbilical hernia naturally divides itself into a consideration of methods which are palliative or mechanical, and methods which are curative or surgical; this again divides the cases into those occurring in infancy and very early childhood, which are readily cured by palliative means, and those occurring in adult life, when a cure is never obtained except by surgery.

Treatment of Umbilical Hernia in Infancy.—The cure of small umbilical protrusions in early infancy is, in some instances, accomplished independently of the family doctor. The grandmother has, on discovering the condition, made a compress of a half dollar, if particularly wealthy, but more frequently of a button-mold, and has held it in place by a belly-band for two or three months, and the hernia has been cured without the doctor ever having known that it existed. This illustrates by what simple methods umbilical hernia may be cured in the new-born child, and makes it seem strange that in the adult its cure can never be obtained, except by a surgical operation.

It has been my habit for many years, both in my clinical and private work, to put no trusses on babies under one year of age, or, in other words, before they begin to walk. They have, with rare exceptions, been treated by a compress over the navel, held in place by one or more strips of zinc oxide plaster. The compress has sometimes, and preferably, been a hard-rubber umbilical pad, such as is found on infant trusses; sometimes it has been a wooden button-mold, and many times a roll of gauze wrapped about by plaster with the sticky side out so that it would stay just where placed. Fine cork with its edges

beveled forms an excellent compress. The hernia should be reduced, the compress placed over the navel, and inch-wide strips of zinc oxide plaster placed across it at different angles, the ends extending about two-thirds of the distance around the body. Two strips are usually sufficient and many times one will answer every purpose. It is not well to have the plaster meet in the back, as there is then no allowance for abdominal distention. I have seen a child who had inguinal hernia produced by plaster applied in this manner and the consequent



Dr. S. W. Kelley's combination of hard-rubber plate and plaster. 1. Hard-rubber plate. 2. Plate with plaster attached. 3. Plaster unbuttoned and plate turned back.

forcing of the abdominal contents into the lower abdomen. This dressing should be removed once a week and renewed after the parts have been bathed.

The suggestion of Dr. Samuel W. Kelley is an excellent one (Ohio State Medical Jour., November 18, 1905) of having a hard-rubber pad with buttons on it, folding the front ends of the plaster back upon itself and cutting a button-hole in the plaster (Figs. 55 and 56). The mother can remove the umbilical plate every day for the purpose of washing the skin without disturbing the plaster, and she can easily renew any part of the plaster that may become loosened. In Germany the method

of using the skin and subcutaneous tissues in the vicinity of the navel as a compress has been adopted and seems to have met with success. The skin and loose tissue on either side of the umbilicus are grasped with thumb and fingers and infolded, the plaster being then placed over. When I first read of the method it impressed me as being particularly good, and I at once adopted it in my clinic; but we found that there was great liability to ulceration of the skin surfaces that were folded together, and soon went back to the use of the compress and plaster, as already described.

Fig. 56.



Dr. S. W. Kelley's method of combining plaster with hard-rubber plate. Plaster is folded back upon itself, and has button holes cut in it.

The length of time required to cure an infant of umbilical hernia seems to depend somewhat upon its age. At three months of age it can ordinarily be cured in three months, but at six months of age it will frequently require six months, while a full year of mechanical support is usually required after the child walks. When it is a year old I seldom resort to the plaster and compress, experience having proven that a light spring controls the hernia with greater certainty. In the group of umbilical trusses for infants will be seen several good forms. My preference with very small children is for the single-spring trusses covered with either hard rubber or celluloid so that they can be kept perfectly clean and worn in the bath. In children

### GROUP OF INFANT UMBILICAL TRUSSES.



1. Infant's hard-rubber single-spring umbilical truss. Sizes, 10 to 21 inches.



2. Infant's hard-rubber single-spring umbilical truss. (Youth's sizes, 22 to 29 inches.)



3. Youth's double-spring hard-rubber umbilical truss.



4. Bow spring (leather covered ) cedar pad umbilical truss.



5. Fine French kid or cedar pad. umbilical truss.



6. Double band elastic hard-rubber plate umbilical truss.



 Umbilical belt truss, sateen band, elastic sides to lace in back. Kid or hardrubber pad.



8. Elastic umbilical truss, hard-rubber cedar, or kid pad.



9. Soft-rubber belt with inflated air pad.

of three years and over I am quite partial to light double springs with the fastening in the back, as shown in Fig. 57.

The selection of the pad or button that presses into the umbilicus is a matter of importance. If the child is very fat the centre projection on the umbilical pad must be quite prominent, in order to reach down to the abdominal wall; if very thin such a prominent centre would do actual harm by wedging





Umbilical hernia (in a child 3 years old) retained by a hard-rubber truss, the spring going around the body on both sides.

itself into the umbilical ring and preventing closure. Sometimes in very thin children the use of a perfectly flat surface is attended by better results. As in inguinal hernia, these cases must be kept under the frequent observation of the physician in order to obtain good results. The children are growing rapidly, and this growth must be provided for. Here, also, as in inguinal hernia, infants are good truss wearers if the skin is kept perfectly clean and dry.

Children under five years of age are almost always cured by the means suggested if they are kept under care; the curability of umbilical hernia by mechanical support, however, diminishes rapidly after passing the third year, and, while in recent cases a few cures may be obtained, even in children ten or twelve years old, this fortunate result has been very rare in my experience. It has been my practice to recommend operative cure in all children who have passed the tenth year, and in some much earlier, where there appeared little prospect of curing by means of the truss. Where springs are used their accurate adjustment will be greatly enhanced by resort to the lead-tape diagram method, which has been described under the mechanical treatment of inguinal hernia.

Mechanical Treatment of Umbilical Hernia in the Adult.

—In the adult umbilical hernia is unquestionably the most difficult of all herniæ to treat either mechanically or surgically, and for this reason its occurrence should always be looked upon as a serious matter even though the hernia be insignificant in size and giving no immediate discomfort. In fact, the most prompt and persistent treatment should be insisted upon from its very inception in order to protect the patient against the many ills and dangers that are sure to follow its neglect.

While there is not such a large variety of trusses made for this form of hernia, there are several good ones from which to select in order to meet the special indications of the case. In small hernia upon a person of medium weight, the single spring trusses are lighter, more convenient and consequently better. Little dependence can be placed upon trusses made of elastic bands, and caution in their use is therefore advised. In those cases where it seems advisable to use a truss at night they answer the purpose admirably, but under their use during the day most cases grow worse.

In selecting springs preference should always be given to those covered by hard rubber or celluloid. In shaping them it must be borne in mind that those covered with hard rubber must be warmed before bending. What has been said about GROUP OF ADULT UMBILICAL TRUSSES.



1. Celluloid single-spring umbilical truss.



2. Double-spring hard-rubber umbilical truss.



3. Chase umbilical truss. Leather cover, cedar pad.



4. Single-spring hard-rubber umbilical truss.



5. Elliptic double-spring hard-rubber umbilical truss-



6. Bow-spring hard-rubber umbilical truss.



7. Elastic umbilical truss.



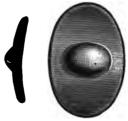
8. Narrow band elastic umbilical truss.



9. Bow-spring leather umbilical truss.



10. Elastic umbilical truss, celluloid plate.



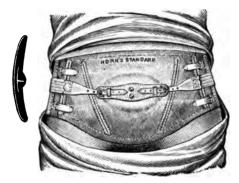
Concave hard-rubber pads.



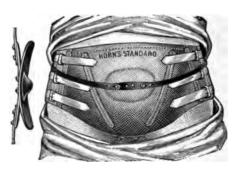




Concave hard-rubber pads for use inside of abdominal belts in irreducible umbilical hernia



11. Combination belt and umbilical pad.



12. Combination belt and umbilical pad with springs outside of belt.



13. Extra hard-rubber pad, elliptic spring, and band to be used in combination with abdominal belt.

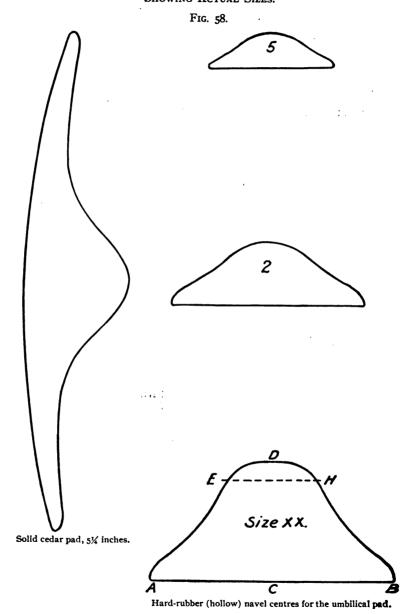


14. Hard-rubber elliptic-spring umbilical truss applied.



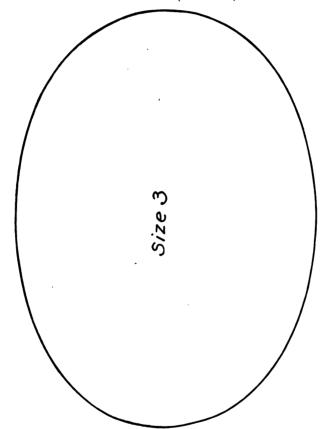
15. Belt for general abdominal support, to which may be added umbilical pad and extra retaining band. Woven silk or cotton-covered thread.

OUTLINES OF UMBILICAL PLATES AND CENTRES.
SHOWING ACTUAL SIZES.



selecting a centre-piece for the plate suitable for the individual child applies with even greater force in the case of the adult. Fat people must have a deep centre and thin persons one that

OUTLINES OF UMBILICAL PLATES AND CENTRES, SHOWING ACTUAL SIZES (Continued).



Hard-rubber plates. Size 3 is  $4\% \times 3\%$  inches; size 2 is 6 x 4% inches, and size 1 is  $7\% \times 5$  inches, on which are used seven sizes of detachable centre pads, of which size  $\times \times$  is the largest and size 5 the smallest.

is not so deep. (See Fig. 58 for an illustration of the size of plates and centre-pieces as ordinarily manufactured by the truss-makers.)

For fat and heavy patients the double-spring truss will afford a firmer and more secure support. In these trusses the springs fasten on stud-head screws that are solidly fixed in the plate, but where very strong pressure is desired the one with an elliptic spring is better. This spring is attached in its





An English umbilical truss, adjusted. (Eccles.)

middle and the ends arch out away from the plate. When the body springs are fastened upon the stud-head screws in the ends of the elliptic spring its action is to throw the plate farther in, giving greatly increased pressure. An extremely large umbilical plate (Fig. 59), with a prominent centre, is used in England. The whole truss is thickly covered with leather, and

compared with those made in this country is a cumbersome affair.

Where the whole abdomen is pendulous, it is frequently desirable to combine general abdominal support with retention of the hernia, as shown in the illustrations. This is an



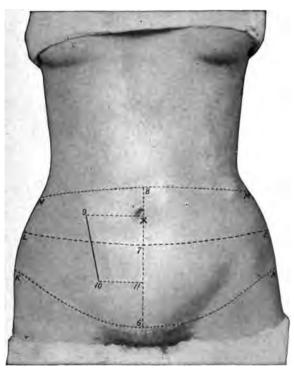


Diagram for abdominal belt and umbilical truss measure.— 1. Umbilical hernia: Circumference on line with navel and shape by lead tape (see Truss-fitting, Inguinal hernia) on same line. 2. Abdominal belts: Circumference at K, L, M; length from 6 to 8. If an umbilical plate is to be added, give distance from 6 to navel. 3. Ventral hernia belts: Circumference M, L, K, 6 to 8. Distance of top of pad from navel to 9, of bottom of pad, 10 to 11.

admirable combination for corpulent people suffering from large reducible or irreducible umbilical hernia. The belt not only gives valuable general support, but prevents the truss springs becoming imbedded in the fat. The umbilical plate, being inside the belt, is also held more securely in place. Where a belt is ordered as a part of the support, careful measures of the abdomen should be forwarded to the manufacturer. The diagram shown in Fig. 60 will aid the physician in taking these measures, and the letters which designate the points of circumference are understood by all reputable manufacturers.

Herniæ containing large omental protrusions are very liable to inflammatory conditions, which may be mistaken for true strangulation. This inflammation is ordinarily due to pro-



Fig. 61.

English rim-plate concave pad truss for irreducible umbilical hernia. (Eccles.)

trusion of a new mass of omentum and its constriction at the hernial aperture. If allowed to follow their own course, sloughing is liable to occur. Long continued hot applications I feel sure favors this result. I have found the use of ice more satisfactory, and have kept it on for several days at a time, with the most happy results. Let it be distinctly understood that I do not approve of any such delay if there is the least indication of intestinal obstruction. By the application of ice and daily gentle manipulations, the hernia can frequently be restored to its former condition.

Irreducible Umbilical Hernia.—This leads to the mechanical treatment of those cases which are only partially reducible.

A few of these can, by confinement to bed and repeated gentle taxis, be converted into reducible herniæ. At least an attempt should be made to reduce all that is possible; then a concave pad, fitting exactly the remaining protrusion, and attached to one of the springs already described, should be applied. In large people, the combination of belt and spring with concave pad of suitable size, is especially desirable. After wearing one of these concave pads over an irreducible hernia, the protrusion may so diminish in size that a smaller pad will be required. The English use a form of truss shown in Fig. 61, which, it would seem, might be useful in the cases under consideration.

The treatment of irreducible umbilical hernia by mechanical means is not attended by an amount of success that is encouraging. In fact the history of such cases is one of constant increase in size, discomfort, and danger. Unless there is some special contra-indication it will be best to advise such patients to submit to surgical treatment.

### CHAPTER X.

# MECHANICAL TREATMENT OF TRAUMATIC VENTRAL HERNIA.

In former years, little was known of traumatic ventral hernia because it was very rarely found except following incised wounds of some form, and it was spoken of as resulting from stab wounds of sabre or bayonet.

Since the days of numerous abdominal operations, however, it has been very frequently met with. Not so often now as a few years past, because the up-to-date surgeon has learned how to close the abdominal wall so securely that hernia is not very likely to occur.

No amount of skill will prevent its occurrence in some cases, as there is present not only an abnormal amount of fat, but the muscles are so infiltrated by it, that they lose their retaining power, and such cases must be protected by external support of some kind.

Many cases of traumatic ventral hernia seen early will show very satisfactory results under mechanical treatment. They must be carefully watched, for, like cases of umbilical hernia, there is in them a strong tendency to grow worse if not kept under perfect control. Contrary to the rule in umbilical hernia, however, they not infrequently improve very materially under the use of mechanical support, and I have seen a few that have been cured without surgical interference.

If the surgeon doubts the stability of his abdominal closure he should give the parts support either by a truss spring to which has been adjusted a suitable pad, or with a general abdominal belt with a special compress arranged over the line of incision. The spring is always best where the wound has been on either side of the median line and, in fact, usually preferable in cases of median incision. The effect of the belt is especially good in some cases where there is great tendency to rapid increase of fat, as it undoubtedly in a measure checks this.

The hard-rubber cross-body spring made for the treatment of inguinal hernia has frequently been used with satisfaction. It is shaped by the lead-tape diagram method suggested in the chapter on the mechanical treatment of inguinal hernia. Such a truss is shown in Fig. 62, applied to a woman sixty-five years old, following an operation for an abscess case of





Woman 65 years old, with ventral hernia following operation for appendicitis, retained by hard-rubber cross-body truss, with ordinary inguinal pad.

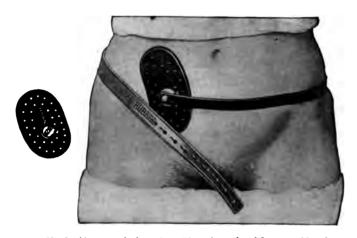
appendicitis, where drainage was necessary for many weeks. Inguinal springs used for this purpose should be reduced in pressure considerably, as the amount required is much less than for other forms of hernia. In a large number of patients the pad used in inguinal hernia can also be used here, as shown. In fact, where the patient is rather fat it is better than the perfectly flat pads made by most truss-makers. The large flat pad rests upon the skin and subcutaneous fat, but does not

## ABDOMINAL HERNIA.

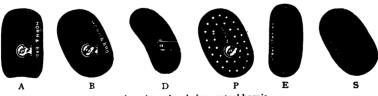
GROUP OF TRUSSES FOR VENTRAL HERNIA.



1. Elastic ventral hernia truss. Soft- or hard-rubber pad.



2. Hard-rubber cross-body spring with perforated pad for ventral hernia.



3. A variety of pads for ventral hernia.

## GROUP OF TRUSSES FOR VENTRAL HERNIA (Continued).



4. Laparotomy belt, with hard-rubber or soft compress.



5. Hood truss. Modified for ventral hernia on right side, and inguinal on left.



6. Cross-body hard-rubber ventral hernia truss to which any desired form of pad may be attached.

reach down to the muscular wall where the difficulty exists. In young and thin subjects the flat pads are admirably well adapted for the purpose.

In enormous protrusions, such as shown in the accompanying illustrations, nothing short of a well-made and accurately-fitted, strong canvas belt will give the general abdominal support that is demanded. In these extreme cases it amounts to the supplying of an artificial wall, and one who has not had experience cannot fully appreciate the difficulties involved. Patience, perseverance, and many refittings will, however, accomplish a great deal, and when we consider that it is in just this class of cases that surgical relief is almost hopeless, the importance of the service of a good belt maker will be more fully realized. A belt used after an abdominal operation should be of stout, unstretching material—not elastic, although this is often inserted to save trouble in fitting. It is to be worn next the skin and straps should not be needed under the thighs to hold it down or make it comfortable. This will ensure the patient using it as directed.

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